Elysium Home

Welcome to Elysium, where dreams come true

Team Home

Welcome to Elysium

Our mission is to revolutionize modern agriculture by developing an IoT-controlled greenhouse system that utilizes real-time data and AI-driven automation to optimize environmental conditions, enhance crop growth, and improve resource efficiency, ensuring sustainable and scalable agricultural practices.

Team metrics

Project Proposal

Deadline Sep 29, 2024

ON TRACK

Progress Report

Deadline Oct 13, 2024

ON TRACK

Final Report

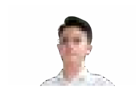
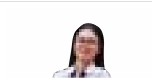
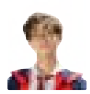
Deadline Nov 24, 2024

OFF TRACK

About Elysium

We're developing a **Smart Greenhouse: IoT-Controlled System** that optimizes crop growth using real-time data and AI automation. Our focus is on smart environmental control, resource efficiency, and user-friendly management tools. Stay tuned for updates on our progress.

Meet the team

 Project Manager @LE TRUONG THIEN NGUYEN	 Software Engineer @NGUYEN DANG DUY LE
 Data Engineer @MINH PHUONG ANH MAI	 AI Specialist @CONG HUNG PHAN
 UI/UX Designer @MINH DUY NGUYEN	 Mentor @Hang Sam Nang

Navigation

- Project Plan
- Elysium Website
- Roles and Responsibilities
- Risk Assessment
- Persona
- Entity Relationship Diagram (ERD)
- Product requirements
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- Meeting notes in space
- Team agreement

Resources

Restrict search to this space's space key.

Search | Search

Latest updates

- 20/10/2024 Meeting notes
- 19/10/2024 Meeting notes
- 16/10/2024 Meeting notes
- 09/10/2024 Meeting notes
- 07/10/2024 Meeting notes
- ....

Where to find us

Zalo: https://zalo.me/g/loefle251

Email: elysium@swin.edu.au

Phone: 0909258664 (Thomas Hang)

Featured resources

Elysium Website

Timeline

	Goal	Progress
Week 1	• Form group • Launch the Project	100%

	• Access necessary workspaces	
Week 2	• Create necessary pages for the Project	100%
Week 3	• Finalize the crucial details of the Project document • Define the relationship of the entities	100%
Week 4	• Overall review of the Project Proposal	100%
Week 5	• Planning to update ERD and create DFD • Introduce team health monitor	100%
Week 6	• Update ERD level 0, 1, 2 • Review the current system, identify areas for improvement	300%
Week 7	• Create DFD • Improve current system • Finalize the progress report	100%

Project Plan

Driver	@LE TRUONG THIEN NGUYEN
Approver	@NGUYEN DANG DUY LE
Contributors	@MINH DUY NGUYEN @CONG HUNG PHAN @MINH PHUONG ANH MAI
Informed	@Hang Sam Nang
Objective	The primary objective of this project is to design and develop a comprehensive IoT-enabled greenhouse system that optimizes environmental conditions—such as temperature, humidity, and lighting—using real-time data and AI-driven algorithms. The system aims to enhance crop yield, improve resource efficiency, and streamline operational management, providing a data-driven approach to modern greenhouse farming.
Due date	Sep 30, 2024
Key outcomes	1. **IoT Sensors and Devices**: Design and deploy sensors for temperature, humidity, soil moisture, CO2, and lighting control. Ensure reliable data transmission to the central system. 2. **Data Management**: Implement real-time analytics and trend monitoring. Store historical data for optimization and reporting. 3. **AI Integration**: Deploy AI models to predict and automate control of temperature, humidity, and irrigation. 4. **User Interface**: Create a user-friendly dashboard and mobile app for remote monitoring and control. 5. **System Testing**: Ensure smooth hardware-software integration and perform comprehensive testing. 6. **Training & Support**: Train staff on system use and provide ongoing technical support.
Status	TO DO / IN PROGRESS / COMPLETE

🤔 Problem Statement

Agricultural Challenges:

Traditional greenhouse farming faces significant challenges in maintaining optimal growing conditions for crops. Factors such as temperature, humidity, lighting, soil moisture, and CO2 levels fluctuate throughout the day and season, making manual monitoring and adjustment time-consuming and inefficient. Farmers often struggle to optimize these environmental conditions, leading to inconsistent crop yields, overuse of resources like water and electricity, and increased operational costs.

Inefficiency in Manual Control:

Greenhouse operators rely on manual processes to control essential factors such as irrigation, ventilation, and lighting. These manual interventions not only require significant labor but also leave room for human error. The inability to respond in real-time to changing environmental conditions can lead to suboptimal growing environments, plant stress, and resource wastage.

Lack of Data-Driven Decision Making:

Many current greenhouse systems lack advanced data collection, analytics, and automation capabilities. Without real-time data on critical factors like temperature, humidity, and soil moisture, greenhouse operators are unable to make informed decisions about when and how to adjust growing conditions. The absence of data-driven insights makes it difficult to predict crop performance, optimize resource usage, or implement proactive adjustments that could improve yield and reduce waste.

Resource Overuse and Sustainability Concerns:

Overuse of water, electricity, and other resources is a common problem in greenhouses that rely on manual control systems. Without precise control and real-time adjustments, greenhouses are often forced to operate inefficiently, leading to excessive consumption of resources. This not only increases operational costs but also raises concerns about sustainability and environmental impact, particularly in regions facing water scarcity or energy limitations.

Need for Automation and Optimization:

To address these challenges, there is a critical need for a smart greenhouse system that can automatically monitor and control environmental factors using IoT sensors and AI-driven algorithms. Such a system would allow for real-time data collection and automated adjustments to temperature, humidity, lighting, and irrigation, ensuring that crops are grown in optimal conditions throughout their lifecycle. By leveraging advanced technologies, greenhouse operators can increase crop yields, reduce resource consumption, and streamline operations, resulting in higher efficiency, lower costs, and improved sustainability.

Project Objective:

This project aims to develop a comprehensive IoT-enabled greenhouse system that uses real-time data and AI algorithms to automatically adjust environmental conditions. The goal is to enhance crop growth, improve resource efficiency, and reduce operational overhead, ultimately contributing to a more sustainable and profitable greenhouse farming model.

In summary, the key issues addressed by the project include:

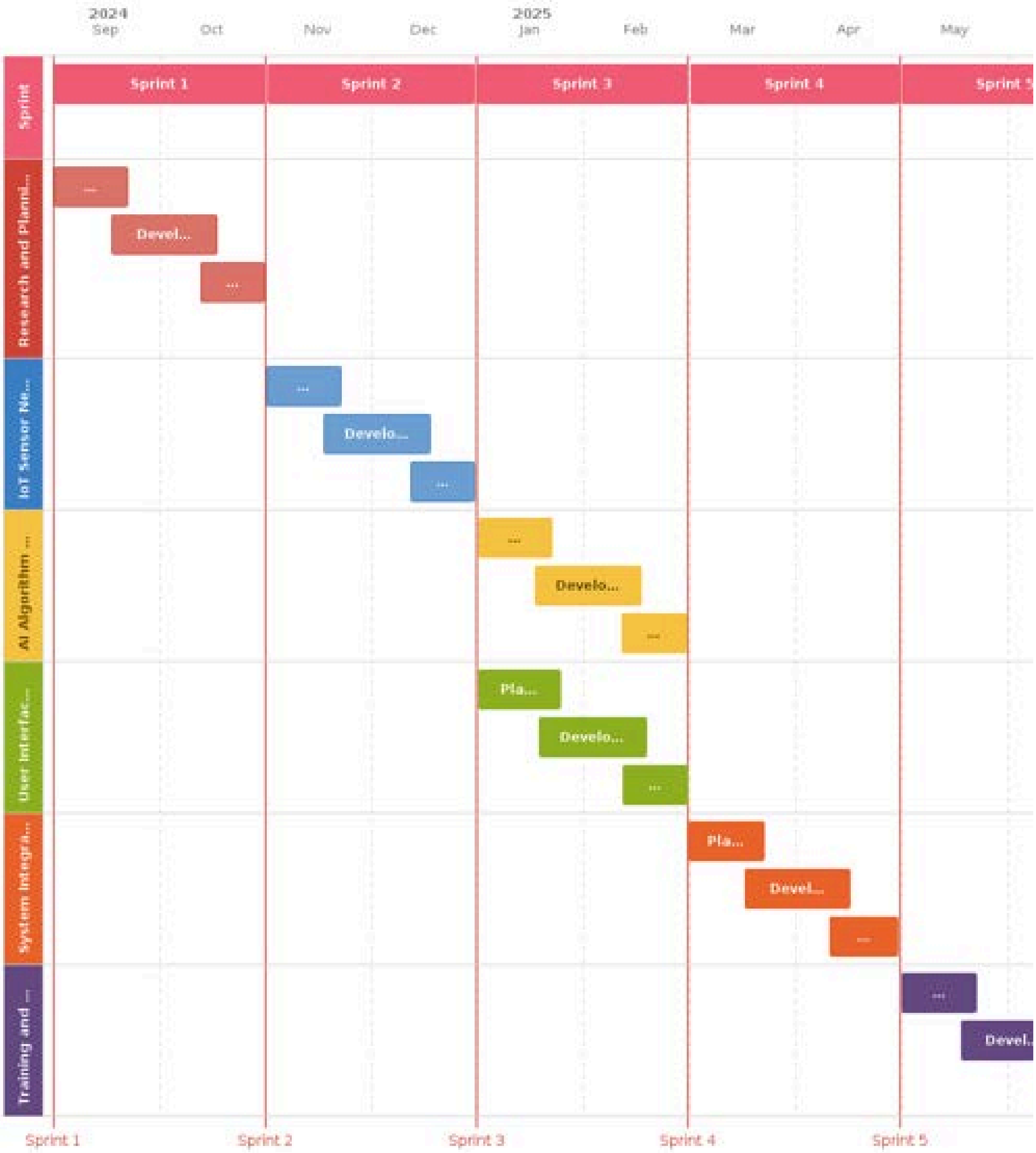
- Inefficiency and inaccuracy in manual greenhouse control.
- Lack of real-time data and automation in optimizing environmental factors.
- Overuse of critical resources, leading to higher costs and unsustainable practices.
- The need for an integrated, automated solution to improve productivity and sustainability in greenhouse farming.

🎯 Scope

Must have:	• IoT sensors for temperature, humidity, soil moisture, and CO2 monitoring. • AI-driven algorithms for automatic adjustments of environmental conditions (temperature, lighting). • Real-time data analytics and monitoring via a central dashboard. • Mobile application for remote monitoring and control. • Automated alerts and notifications for critical conditions. • System integration and end-to-end testing (unit, integration, user acceptance).

	• Training and support for greenhouse staff.
Nice to have:	• AI-based predictive maintenance for greenhouse equipment (e.g., lighting, irrigation systems). • Integration with other farm management systems for advanced analytics. • Historical data trend analysis for optimizing long-term crop yields. • Advanced reporting and customizable user dashboards. • Voice control integration for hands-free system operation. • Advanced mobile app features such as push notifications for regular status updates.
Not in scope:	• Greenhouse structural changes or renovations (e.g., building new greenhouses). • Integration with non-agricultural systems or third-party consumer applications. • External weather prediction algorithms (beyond data collected by greenhouse sensors). • Hardware development for new sensor technologies beyond standard off-the-shelf components.

📅 Timeline



🚩 Milestones and deadlines

Milestone	Owner	Start Date	Deadline	Description	Status
Research and Planning	@LE TRUON	Sep 01, 2024	Oct 31, 2024	Finalize project requirements and	In Progress

	G THIEN NGUYEN			allocate resources for the project.	
IOT Sensor Network Setup	@NGUYEN DANG DUY LE @MINH PHUONG ANH MAI	Nov 01, 2024	Dec 31, 2024	Install IoT sensors, configure lighting, ensure data collection, and test data transmission.	To do
AI Algorithm Development	@CONG HUNG PHAN @MINH PHUONG ANH MAI	Jan 01, 2025	Feb 28, 2025	Develop and test AI models for automating environmental adjustments. Ensure data accessibility for AI models.	To do
User Interface Development	@MINH DUY NGUYEN	Jan 01, 2025	Feb 28, 2025	Design the central dashboard and mobile application for system monitoring and control.	To do
System Itegration and Testing	@NGUYEN DANG DUY LE @MINH PHUONG ANH MAI	Mar 01, 2024	Apr 30, 2024	Complete system integration, test data pipelines, and conduct full system testing.	To do
Training and Deployment	@LE TRUONG THIEN NGUYEN	May 01, 2024	Jun 31, 2024	Train greenhouse staff, deploy the system, and ensure data pipeline stability.	To do

Reference materials

1. Lottes, P., Khanna, R., Pfeifer, J., Siegwart, R., & Stachniss, C. (2017). UAV-based crop and weed classification for smart farming. In *2017 IEEE International Conference on Robotics and Automation (ICRA)* (pp. 3024-3031). https://doi.org/10.1109/ICRA.2017.7989343
2. Mabrouki, J., Fattah, G., Kherraf, S., Abrouki, Y., Azrour, M., & El Hajjaji, S. (2022). Artificial intelligence system for intelligent monitoring and management of water treatment plants. In *Emerging real-world applications of Internet of Things* (pp. 69–87). CRC Press.
3. Maraveas, C. (2023). Incorporating artificial intelligence technology in smart greenhouses: Current state of the art. *Applied Sciences*, *13*(1), 14. Incorporating Artificial Intelligence Technology in Smart Greenhouses: Current State of the Art
4. Tripathy, P. K., Tripathy, A. K., Agarwal, A., & Mohanty, S. P. (2021). MyGreen: An IoT-enabled smart greenhouse for sustainable agriculture. *IEEE Consumer Electronics Magazine*, *10*(1), 57–62. https://doi.org/10.1109/MCE.2021.3055930

5. Wang, X., & Yu, H. (2019). Research on the control system of the intelligent greenhouse of IoT based on Zigbee. *Journal of Physics: Conference Series*, *1345*(4), 042036. Research on Control System of Intelligent Greenhouse of IoT Based on Zigbee - IOPscience

Budget

Project Details:

Proposal Organizers: @LE TRUONG THIEN NGUYEN

Project Name: Elysium

Team: Project Team

Project Dates: Sep 01, 2024

Approvers: @Hang Sam Nang

Budget Requirements & Costs

Expense Item	Explanation	Deadline	Cost
Direct Costs			
Sensor Installation	Installation costs for IoT sensors across greenhouses	Dec 31, 2024	$10,000
Software Development	Development of analytics and control software	Feb 28, 2025	$25,000
Data Management	Costs for cloud storage and data management solutions	Jan 31, 2025	$5,000
Licensing Fees	Software licensing for tools and platforms used	Ongoing	$2,000
Maintenance Contracts	Annual maintenance contracts for software and hardware	Mar 01, 2025	$3,500
Training Workshops	On-site training for staff on new systems	May 15, 2025	$4,000
Greenhouse Construction	Costs for building a typical greenhouse for	Oct 01, 2024 - Nov 31, 2024	$30,000

	R&D		
Greenhouse Rentals	Costs for renting additional greenhouses for research	Ongoing	$15,000
Testing Zones	Setting up specific zones for technology testing and adaptation	Ongoing	$8,000
Third-Party Management	Hiring third-party services for greenhouse care (security, maintenance)	Ongoing	$6,000
Indirect Costs			
Administrative Fees	General administrative costs associated with the project	Ongoing	$2,000
Marketing Expenses	Costs of promoting the greenhouse technology	May 15, 2025	$5,000
Consultation Fees	Costs for expert consultations during project phases	Ongoing	$1,500
Equipment Costs			
Computing Equipment	Purchase of computers, servers, and related hardware	Oct 15, 2024	$8,000
IoT Sensor Equipment	Cost of IoT sensors and related hardware	Oct 31, 2024	$12,000
Network Infrastructure	Setup and maintenance of networking equipment	Oct 31, 2025	$4,000
Travel Costs			
Site Visits	Travel expenses for visits to greenhouse locations	Ongoing	$3,000
Conferences	Attendance and travel for industry conferences	Apr 15, 2025	$2,500
Other Costs			
Training Materials	Development of training materials for staff	Apr 30, 2025	$1,200
Contingency Fund	Reserved funds for unexpected expenses	Ongoing	$5,000
Research & Development	Budget for R&D to improve technology	Ongoing	$4,000

TOTAL			**$156,700**

Summary of Costs:

- **Direct Costs**: $108,500
- **Indirect Costs**: $8,500
- **Equipment Costs**: $24,000
- **Travel Costs**: $5,500
- **Other Costs**: $10,200

TOTAL = **$156,700**

Project Timeline:


2024
Sep
Oct
Nov
Dec
2025
Jan
Feb
Mar
Apr
May
Sprint
Research and Planning
IOT Sen...
AI Algorithm ...
User Int...
System I...
Training...
Sprint 1
Sprint 2
Sprint 3
Sprint 4
Sprint 5
Comput...
IOT Se...
Networ...
Sensor ...
Data ...
Softwa...
Mainte...
Greenhouse Constru...
Confer...
Trainin...
Market...
Traini...
Sprint 1
Sprint 2
Sprint 3
Sprint 4
Sprint 5

Roles and Responsibilities

📋 Overview

Identify and discuss team responsibilities by following the instructions for the Roles and Responsibilities Play.

Team	Elysium
Team members	@LE TRUONG THIEN NGUYEN @MINH DUY NGUYEN @CONG HUNG PHAN @NGUYEN DANG DUY LE @MINH PHUONG ANH MAI
Date	Sep 16, 2024
Team mission	To collaboratively design and implement innovative solutions that leverage IoT, AI, and data engineering to create a seamless, automated greenhouse system, ensuring optimal efficiency, sustainability, and growth for agricultural environments. Together, we strive to push the boundaries of technology while delivering a user-friendly and reliable product.

📘 Roles and responsibilities

Roles	Responsibilities (what others think)	Responsibilities (what I think)	Comments
Project Manager (PM)	• Keeps the project on schedule and meets deadlines. • Manages communication between teams and stakeholders. • Addresses risks and issues effectively.	• Balances team and stakeholder needs while maintaining progress. • Problem-solves without overwhelming the team. • Makes tough decisions to keep the project on track.	@LE TRUONG THIEN NGUYEN
Software Engineer	• Builds the application based on the UI design	• Translates the design into a functional application.	@NGUYEN DANG DUY LE

	from the designer. • Integrates software with AI and Data systems smoothly. • Ensures the system runs efficiently and without issues.	• Works closely with AI and Data teams to align functionality. • Maintains and improves the system's performance.	
AI Specialist	• Automates the greenhouse system with AI algorithms. • Predicts and adjusts conditions using data. • Optimizes the system with real-time analysis.	• AI needs constant refinement based on real data. • The system must adapt and improve continuously. • Alignment with the project goals is essential for AI success.	@CONG HUNG PHAN
UI/UX Designer	• Designs an intuitive and user-friendly interface. • Ensures the system is easy to navigate for all users. • Makes the interface visually appealing and functional.	• Prioritizes usability alongside visual design. • Balances aesthetics with efficiency. • Regular testing and feedback are vital for improvements.	@MINH DUY NGUYEN
Data Engineer	• Designs and manages data pipelines for collecting and processing sensor data. • Ensures data is stored and accessible for AI and other systems. • Provides a reliable infrastructure for data-driven decision-making.	• Building robust pipelines ensures smooth data flow. • Collaboration with AI and other teams is essential for data integration. • Maintaining data accuracy and availability is critical for system optimization.	@MINH PHUONG ANH MAI

Risk Assessment

📋 Background

The Smart Greenhouse project aims to design and develop an IoT-enabled greenhouse system that adjusts temperature, humidity, and lighting based on real-time data and AI algorithms to optimize **crop growth conditions**. The project involves creating a sophisticated system integrating IoT sensors, AI algorithms, and automated control mechanisms.

Risks management

Risk rating

LOW	**MEDIUM**	**HIGH**	**EXTREME**
• Acceptable • Ok to proceed	• As low as reasonably practicable • Take mitigation efforts	• Generally unacceptable • Seek support	• Intolerable • Place event on hold

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LIKELIHOOD	**SEVERITY**			
	ACCEPTABLE *Little to no effect on the event*	**TOLERABLE** *Effects are felt, but not critical to outcome*	**UNDESIRABLE** *Serious impact on the course of action and outcome*	**INTOLERABLE** *Could result in disaster*
IMPROBABLE *Risk is unlikely to occur*	• Minimal delays due to sensor availability	• Minor issues with non-critical sensors	• Electrical system failures	• Automation System Failures
POSSIBLE *Risk will likely occur*	• Team Members Misunderstanding	• UI Complexity for Users • Unoptimized System Performance	• IoT Sensor Failures • Lack of Training	• Budget Overrun • Data Security Breaches

PROBABLE *Risk will occur*	• Environmental Variability Tolerance	• Resource Allocation	• Timeline Overruns	• AI Algorithm Inaccuracy

✅ Action items

1. **IoT Sensor Failures:**
   - **Action:** Implement routine maintenance schedules and quality checks for IoT sensors.
   - **Responsibility:** Technical team and sensor providers.
   - **Deadline:** Bi-monthly reviews.
   - **Goal:** Reduce downtime and ensure high-quality sensor output.
2. **AI Algorithm Inaccuracy:**
   - **Action:** Continuously test AI models against historical and real-time data.
   - **Responsibility:** Data science team.
   - **Deadline:** Quarterly AI model updates and performance tests.
   - **Goal:** Increase the accuracy of environmental predictions.
3. **Data Security Breaches:**
   - **Action:** Apply encryption protocols and access control measures.
   - **Responsibility:** Cybersecurity team.
   - **Deadline:** Monthly security audits.
   - **Goal:** Minimize unauthorized access and data breaches.
4. **Timeline Overruns:**
   - **Action:** Break the project into smaller milestones and adopt Agile methodology.
   - **Responsibility:** Project manager.
   - **Deadline:** Weekly sprints with daily stand-ups.
   - **Goal:** Keep the project on track and minimize delays.
5. **Resource Allocation:**
   - **Action:** Allocate skilled personnel and hire external experts as needed.
   - **Responsibility:** HR and project leads.
   - **Deadline:** Before the project begins, with reviews every sprint.
   - **Goal:** Avoid skill gaps that might delay progress.
6. **Budget Overrun:**
   - **Action:** Monitor costs closely and have contingency funds in place.
   - **Responsibility:** Finance team.
   - **Deadline:** Monthly budget reviews.
   - **Goal:** Stay within the allocated budget, allowing for 10% contingency.
7. **Automation System Failures:**
   - **Action:** Set up system redundancy and backup protocols.
   - **Responsibility:** IT operations.
   - **Deadline:** Redundancy systems to be fully operational within the first quarter.
   - **Goal:** Ensure stable operations in case of system failures.
8. **Environmental Variability:**
   - **Action:** Equip sensors with weather-resistant designs and set calibration checks.
   - **Responsibility:** Hardware and engineering team.
   - **Deadline:** Pre-deployment and semi-annual reviews.

- **Goal:** Minimize environmental impact on sensor accuracy.

9. **User Interface Complexity:**
   - **Action:** Conduct user experience testing and iterative UI redesigns.
   - **Responsibility:** UI/UX design team.
   - **Deadline:** User testing at the end of each sprint.
   - **Goal:** Deliver an intuitive interface that meets user needs.
10. **Lack of Training:**
    - **Action:** Develop and distribute comprehensive user manuals and host training sessions.
    - **Responsibility:** Training and support team.
    - **Deadline:** Training before system deployment, with ongoing support.
    - **Goal:** Ensure users are proficient in system operations
11. **Unoptimized System Performance**
    - **Action:** Regularly analyze system performance metrics and identify bottlenecks.
    - **Responsibility:** IT operations team.
    - **Deadline:** Monthly performance reviews and optimization reports.
    - **Goal:** Enhance overall system efficiency and reduce response times.
12. **Minimal delays due to sensor availability**
    - **Action**: Establish agreements with multiple sensor suppliers to ensure quick access to replacement sensors and avoid shortages.
    - **Responsibility**: Procurement team and supplier management.
    - **Deadline**: Establish supplier agreements within the next quarter, and maintain ongoing supplier evaluation every 6 months.
    - **Goal**: Minimize project delays caused by sensor unavailability and ensure timely installation of sensors.
13. **Minor issues with non-critical sensors**
    - **Action**: Implement a secondary monitoring system to detect issues with non-critical sensors and ensure that they are addressed promptly.
    - **Responsibility**: Technical support team and sensor integration team.
    - **Deadline**: Set up the monitoring system within the next 2 months and conduct weekly system health checks.
    - **Goal**: Ensure non-critical sensor issues are detected early and resolved quickly to maintain consistent system performance
14. **Electrical System Failures**:
    - **Action**: Implement a backup power supply system (e.g., generators or solar panels) to ensure continuous operation in case of electrical system failures. Conduct regular electrical system inspections and maintenance.
    - **Responsibility**: Electrical engineering team and facility management.
    - **Deadline**: Backup system implementation within the next 4 months, with monthly maintenance checks.
    - **Goal**: Minimize the risk of greenhouse system downtime caused by electrical failures, ensuring continuous operation and crop health.
15. **Team Members' Misunderstanding**:
    - **Action**: Conduct regular team alignment meetings, and provide comprehensive training sessions on the project goals, roles, and communication protocols. Establish clear documentation of processes and guidelines to ensure team members are aligned.
    - **Responsibility**: Project management and team leaders.
    - **Deadline**: Bi-weekly team meetings and quarterly training sessions.
    - **Goal**: Reduce miscommunication and ensure that all team members have a clear understanding of their responsibilities and the project's objectives, improving overall collaboration and efficiency.

Risk Dictionary

1. **IoT Sensor Failures**: This risk refers to the malfunction or failure of IoT sensors, which can lead to inaccurate data, system downtime, and crop damage.

2. **AI Algorithm Inaccuracy**: This risk involves the inaccuracy of AI models in predicting environmental conditions, which can result in poor decision-making and suboptimal crop growth.
3. **Data Security Breaches**: This risk refers to unauthorized access, theft, or manipulation of sensitive data, which can compromise the system's integrity and lead to financial losses.
4. **Timeline Overruns**: This risk involves delays in project completion, which can lead to cost overruns, resource reallocation, and missed deadlines.
5. **Resource Allocation**: This risk refers to the inadequate allocation of skilled personnel, equipment, or budget, leading to project delays, poor quality work, and resource waste.
6. **Budget Overrun**: This risk involves exceeding the allocated budget, which can lead to financial losses, project cancellation, or scope reduction.
7. **Automation System Failures**: This risk refers to the failure of automation systems, which can lead to system downtime, crop damage, and financial losses.
8. **Environmental Variability**: This risk involves the impact of environmental factors (e.g., weather, temperature, humidity) on sensor accuracy and system performance.
9. **User Interface Complexity**: This risk refers to the complexity or unintuitiveness of the user interface, which can lead to user frustration, errors, and poor system adoption.
10. **Lack of Training**: This risk involves the inadequate training of users, which can lead to poor system operation, errors, and decreased productivity.
11. **Unoptimized System Performance:** This risk refers to the inefficiencies or bottlenecks in the Smart Greenhouse system, leading to reduced performance, slow processing, and decreased productivity.
12. **Minimal Delays due to Sensor Availability:** This risk refers to the possibility of delays in the project timeline caused by the unavailability of critical IoT sensors.
13. **Minor Issues with Non-Critical Sensors:** This risk involves minor malfunctions or performance issues with non-critical sensors that may not immediately affect the overall system performance but could lead to data inaccuracies if left unchecked.
14. **Electrical System Failures**: This risk refers to the potential for power outages or malfunctions in the electrical system, which could lead to system downtime, malfunction of the IoT devices, and disruption of automated environmental controls.
15. **Team Members Misunderstanding**: This risk refers to the possibility of team members misinterpreting project goals, processes, or their roles, leading to misaligned efforts, delays, and potential errors in project execution.

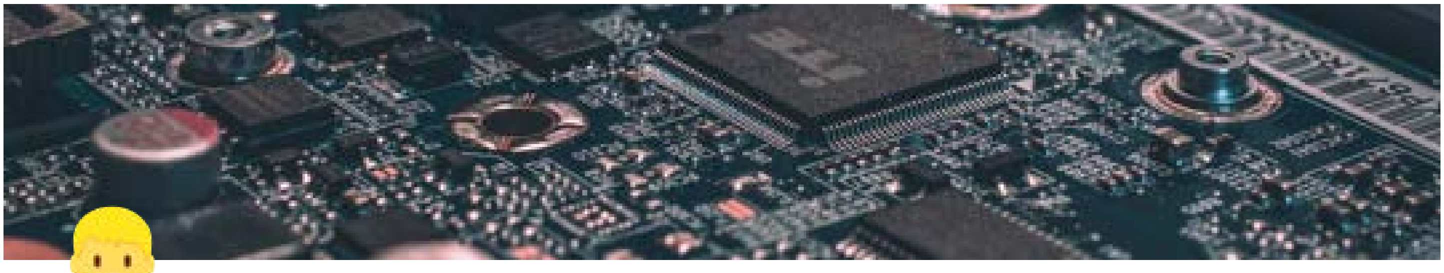
Persona

Here are the personas of our projects:

Persona 1 : Elon Musk - Technology Provider

Persona 2 : Scott Angle - Greenhouse Operator

Persona 3 : Thomas Hooft - Crop Farmer



Persona 1

Elon Musk

Persona name	Elon Musk
Persona role	Technology Provider
Job description	Elon is a visionary entrepreneur responsible for driving the integration of cutting-edge AI and IoT technologies into agriculture. He spearheads innovation in smart greenhouses with a focus on automation and sustainability.

🏢 Company

Company name	Tesla Green Ventures
Company size	100,000+ employees (Tesla)
Industry	Technology and Agriculture

👥 Demographic information

Age	52
Gender	Male
Income	$300 million+/year
Education level	Bachelor's in Physics and Economics
Residential environment	Urban (Los Angeles, CA)

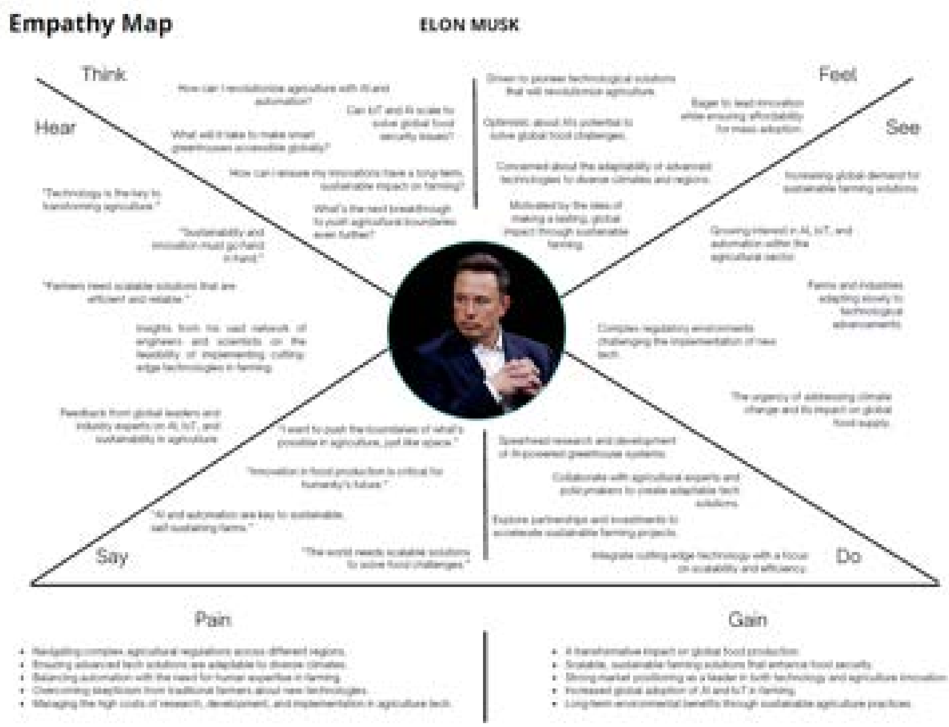
🖋 Personal quote

"I want to push the boundaries of what's possible in agriculture, just like space."

📜 Biography

Elon Musk has revolutionized multiple industries, from electric vehicles to space travel. Now, he's turning his focus to agriculture, believing that innovation in food production is critical for humanity's future. His ambition is to combine AI and automation to create self-sustaining farms that can address global food challenges.

Professional goals	**Motivators**
• Integrate AI, IoT, and automation into smart greenhouses to boost crop yield and efficiency while reducing environmental impact. • Scale sustainable farming solutions globally to ensure future food security.	• Innovation, sustainability, and making a large-scale impact on humanity. • Driving change in traditional industries with breakthrough technologies.
Challenges	**Sources of information**
• Navigating agricultural regulations while adapting advanced technologies to different climates and regions. • Balancing automation with human involvement in farming and ensuring affordability for broad adoption.	• Scientific research papers on sustainable farming. • Cutting-edge technology blogs and his vast network of experts in AI, engineering, and sustainability.



Elon Musk’s empathy map

Persona 2

Scott Angle

Persona name	**Scott Angle**
Persona role	Greenhouse Operator
Job description	Scott oversees daily operations within smart greenhouses, ensuring systems run smoothly and crops are growing optimally.

🏢 Company

Company name	GreenLeaf Farms
Company size	50 employees
Industry	Agriculture

👥 Demographic information

Age	42
Gender	Male
Income	$65,000/year
Education level	Associate Degree in Horticulture
Residential environment	Rural

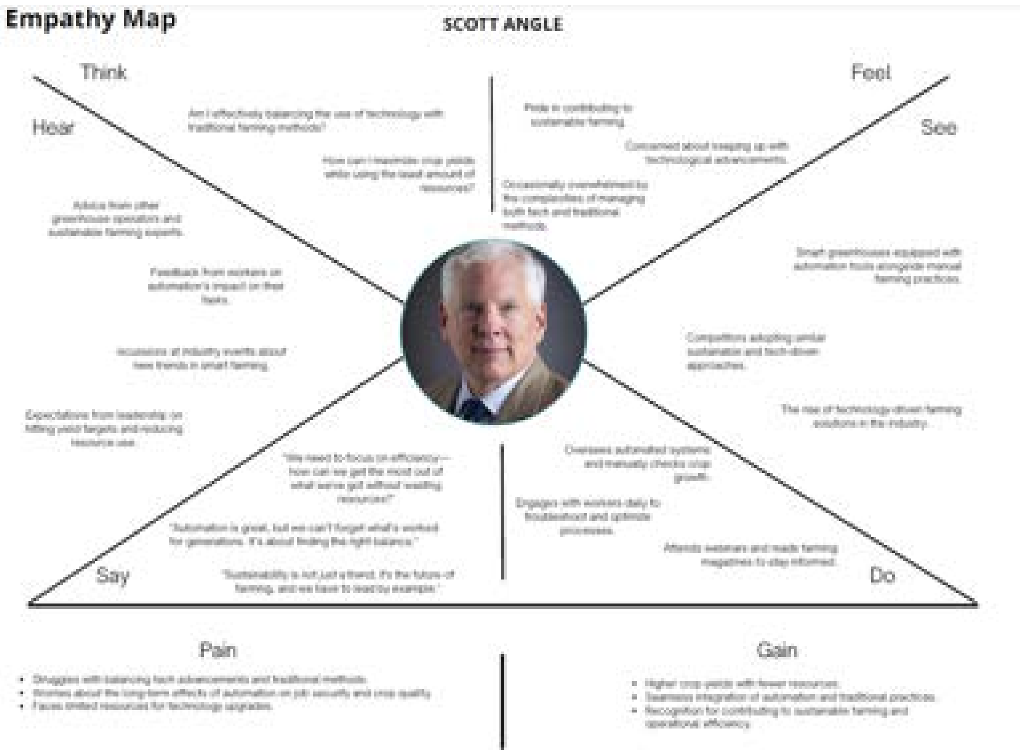
🖋️ Personal quote

"My mission is to grow the best crops while using the least resources."

📜 Biography

Scott has been managing greenhouses for over 15 years, with expertise in automation and sustainable farming methods.

Professional goals	**Motivators**
• To maximize crop yields with minimal resource use.	• Sustainable farming and operational efficiency.
Challenges	**Sources of information**
• Balancing technology and traditional farming methods.	• Farming magazines, agricultural webinars.



Scott Angle’s empathy map

Persona 3

Mr Thomas Hooft - Founder of Dalat Hasfarm at seminar "Partnership in Horticulture' organized by VCT in Dalat

Persona name	Thomas Hooft
Persona role	Crop Farmer
Job description	Thomas manages crop growth and care, utilizing smart technologies to optimize plant health.

Company

Company name	DaLat HasFarms
Company size	10 employees
Industry	Agriculture

👥 Demographic information

Age	68
Gender	Male
Income	$50,000/year
Education level	Bachelors in Agricultural Science
Residential environment	Suburban

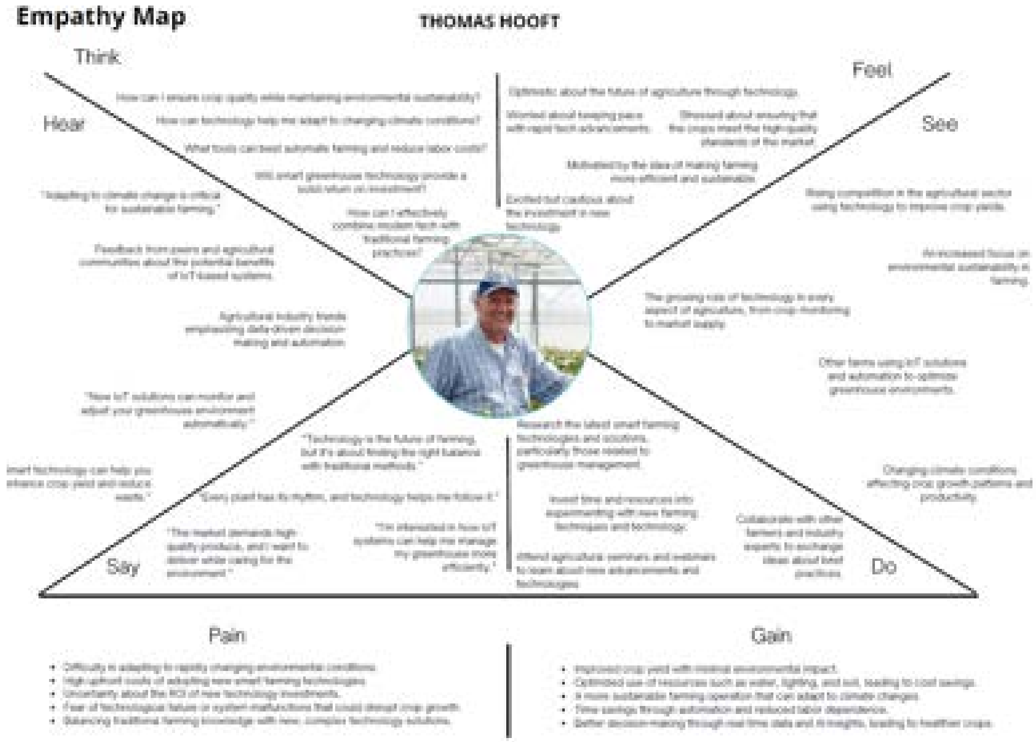
🖋️ Personal quote

“Every plant has its rhythm, and technology helps me follow it.”

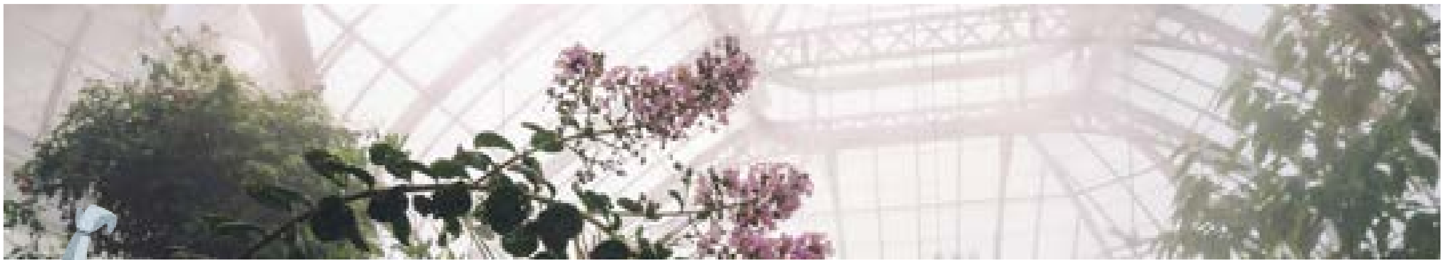
📜 Biography

Thomas grew up on her family farm and has embraced new technologies to modernize traditional farming practices.

Professional goals	**Motivators**
• To grow high-quality crops with minimal environmental impact.	• Environmental sustainability and crop quality.
Challenges	**Sources of information**
• Adapting to changing environmental conditions.	• Farming communities, agricultural blogs.



Thomas Hooft's empathy map



Product requirements

Add Product requirements

Title	Designer	Document owner	Document status	Epic	QA	Target release
Elysium Product requirements	@MINH DUY NGUYEN	@LE TRUONG THIEN NGUYEN	IN PROGRESS	(see table below)	@LE TRUONG THIEN NGUYEN	June 2025

Type	Key	Summary	Assignee
	SCRUM-7	Training and Deployment	LE TRUONG THIEN
	SCRUM-6	System Itegration and Testing	LE TRUONG THIEN
	SCRUM-5	User Interface Development	LE TRUONG THIEN
	SCRUM-4	AI Algorithm Development	LE TRUONG THIEN
	SCRUM-3	IOT Sensor Network Setup	LE TRUONG THIEN
	SCRUM-2	Research and Planning	LE TRUONG THIEN

6 items Synced just now

Elysium Product requirements

Target release	June 2025
Epic	(see table below)
Document status	IN PROGRESS
Document owner	@LE TRUONG THIEN NGUYEN
Designer	@MINH DUY NGUYEN
Tech lead	@NGUYEN DANG DUY LE
Technical writers	@CONG HUNG PHAN @MINH PHUONG ANH MAI
QA	@LE TRUONG THIEN NGUYEN

Type	Key	Summary	Assignee	Priority	Status	Updated
	SCRUM-7	Training and Deployment	LE TRUONG THIEN N	Med...	TO DO	Oct 9, 2024, 13:16
	SCRUM-6	System Itegration and Testing	LE TRUONG THIEN N	Med...	TO DO	Oct 9, 2024, 13:16
	SCRUM-5	User Interface Development	LE TRUONG THIEN N	Med...	TO DO	Oct 9, 2024, 13:13
	SCRUM-4	AI Algorithm Development	LE TRUONG THIEN N	Med...	TO DO	Sep 27, 2024, 06:54
	SCRUM-3	IOT Sensor Network Setup	LE TRUONG THIEN N	Med...	TO DO	Sep 27, 2024, 13:16
	SCRUM-2	Research and Planning	LE TRUONG THIEN N	Med...	TO DO	Oct 9, 2024, 13:21

6 items

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🎯 Objective

To develop and implement an IoT-enabled smart greenhouse system that uses real-time data and AI-driven automation to optimize environmental conditions, reduce energy consumption, increase crop yields, and improve operational efficiency, while ensuring minimal downtime and user-friendly access through mobile applications.

📊 Success metrics

Goal	Metric
Optimize greenhouse climate control	Achieve a 20% reduction in energy consumption within 6 months by optimizing heating, cooling, and lighting systems.
Increase crop yield and quality	15% increase in crop yield and a 10% improvement in crop quality over the next growing season.
Enhance operational efficiency	Reduce manual interventions by 30% through automated systems within the first 3 months of deployment.
Improve data-driven decision-making	80% of operational decisions are made using AI-driven insights and real-time sensor data within the first 3 months.
Minimize system downtime	Maintain system uptime at or above 99% for IoT sensors and control systems over 12 months.
Boost user engagement with mobile app.	Achieve 90% active usage rate of the mobile app by greenhouse operators within 2 months.
Improve crop health with real-time monitoring	Reduce crop disease incidence by 25% through real-time health monitoring and early detection systems.

🤔 Assumptions

1. Assumptions About Users

- **Familiarity with Technology**: Users (farmers, greenhouse operators, technicians) are moderately familiar with mobile applications and basic technology. They may need training to effectively use advanced features like AI-driven analytics.
- **Mobile App Usage**: Users will rely heavily on the mobile application for real-time monitoring and control. They will expect the app to provide clear, actionable data and be intuitive to use with minimal setup.
- **Data-Driven Decisions**: Users will trust and utilize AI-driven insights and automated control systems to make critical decisions regarding irrigation, lighting, and climate control in the greenhouse, though they may prefer to retain some manual override options.
- **Varied Experience Levels**: Users will range from experienced agricultural consultants to farmers with little exposure to advanced IoT and AI technologies. Hence, simplicity and user-friendliness in the UI will be critical.
- **Desire for Increased Productivity**: Users are likely looking to increase crop yields and operational efficiency through technology without requiring much technical intervention on their part.

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2. Technical Constraints

- **Limited Internet Connectivity**: Some greenhouses might operate in areas with limited or unreliable internet connections. The system should have some offline capabilities or buffer data for upload when connectivity is restored.
- **Scalability Requirements**: The system needs to handle multiple greenhouses of varying sizes with different sensor configurations. As more greenhouses and sensors are added, the infrastructure must scale efficiently to handle increasing data loads.
- **Sensor and Hardware Compatibility**: The system needs to be compatible with a wide range of IoT sensors, actuators, and devices, and should easily integrate with existing setups without needing proprietary hardware.
- **Energy Efficiency**: In rural or energy-constrained environments, minimizing the power consumption of sensors, control systems, and networking hardware will be a major concern.

- **Data Privacy and Security**: The system will collect sensitive operational data about greenhouse environments, so ensuring secure data transmission and storage will be essential. Encryption and access control mechanisms must be in place to prevent unauthorized access.
- **Limited User Technical Expertise**: Users may not be experts in maintaining advanced IoT or AI systems, so the system should be easy to troubleshoot and maintain. Automated diagnostics and user-friendly error reporting will be key.

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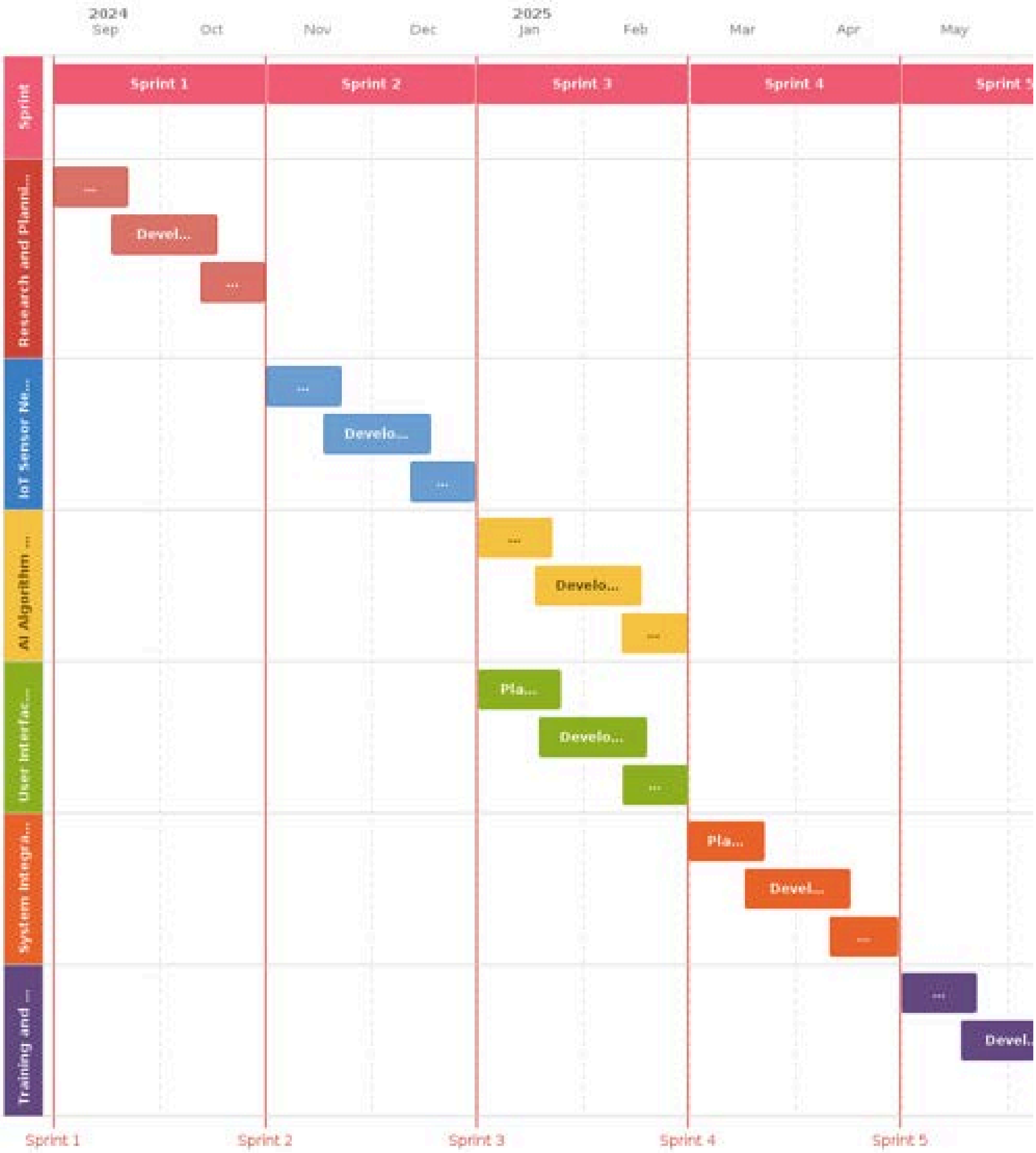
3. Business Goals

- **Increase Crop Yields**: The primary goal is to help users significantly increase their crop yields through optimized greenhouse operations driven by real-time data and AI.
- **Reduce Operational Costs**: By automating climate control, irrigation, and other functions, users can reduce manual labor costs, minimize resource wastage, and lower energy consumption.
- **Market Differentiation**: The business aims to stand out by offering a cutting-edge solution for smart agriculture. It leverages AI and IoT to improve operational efficiency, thereby becoming a leader in the precision farming market.
- **Sustainability Focus**: A key business objective is to promote sustainability by enabling greenhouses to optimize resource use (water, energy) and reduce their environmental footprint through better management of inputs.
- **Customer Satisfaction and Retention**: By offering a user-friendly mobile app, reliable real-time monitoring, and actionable AI insights, the company aims to improve customer satisfaction and retain clients by ensuring that technology directly benefits their productivity.
- **Revenue Growth**: The business aims to drive revenue by offering premium services, including advanced analytics, AI-driven predictions, and extended support packages for larger-scale greenhouses or farming enterprises.
- **Expand to New Markets**: The long-term goal includes expanding the product into new geographic markets, both locally and internationally, by offering customizable solutions that work in different climates and agricultural conditions.

🌟 Milestones

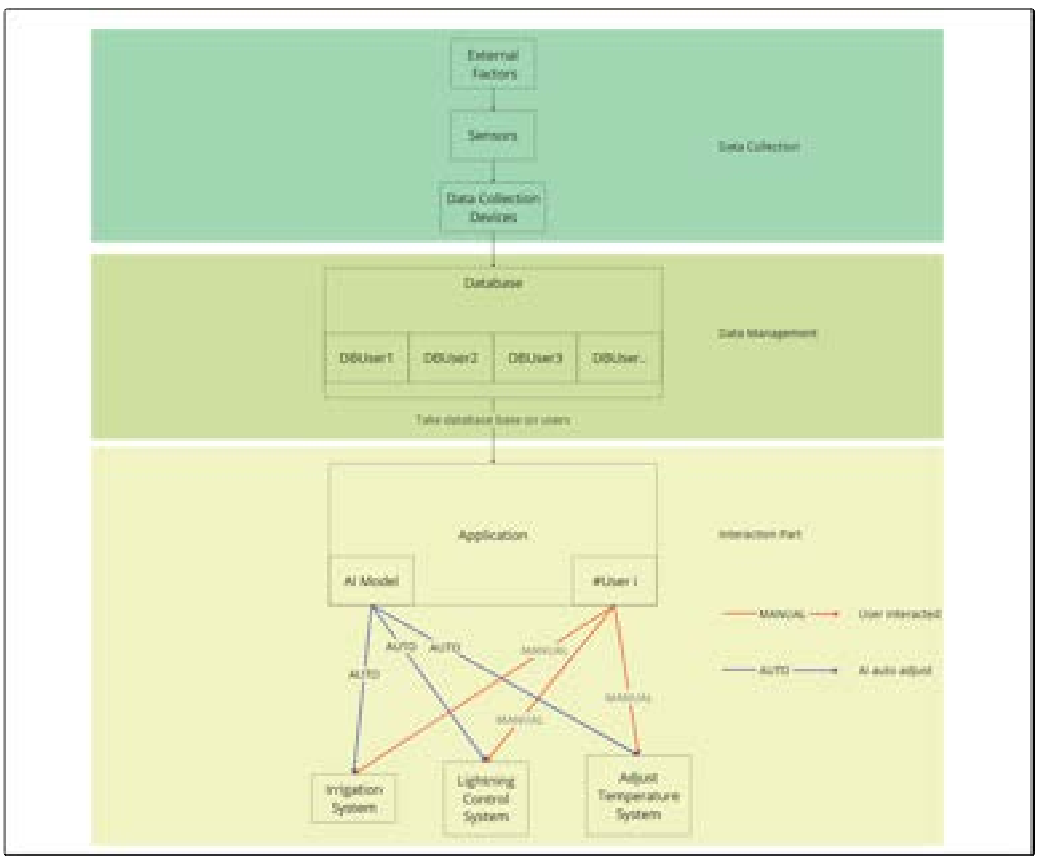


Requirements

Requirement	User Story	Importance	Jira Issue
IoT Sensor Integration	As a greenhouse manager, I want to monitor real-time temperature, humidity, lighting, soil moisture, and	HIGH	

	CO2 levels so that I can ensure optimal growing conditions for my crops.		Type Key Summary SCRUM-29 IoT Sensor Integ 1 item Synced just now
Data Aggregation and Real-Time Analytics	As a data analyst, I want to access centralized, real-time data from all greenhouse sensors so that I can analyze current conditions and trends to make informed decisions.	HIGH	Type Key Summary SCRUM-30 Data Aggregatior 1 item Synced just now
Mobile Application	As a farm owner, I want to access the greenhouse control system via a mobile app so that I can monitor and manage operations remotely.	MEDIUM	Type Key Summary SCRUM-53 Accessibility Test SCRUM-31 Mobile Applicatio 2 items Synced just now
Comprehensive User Training	As a new greenhouse employee, I want to receive thorough training on the system so that I can operate and maintain it effectively.	MEDIUM	Type Key Summary SCRUM-32 Comprehensive I 1 item Synced just now
Integration with Existing Systems	As an IT manager, I want the new IoT greenhouse system to integrate with our existing farm management systems so that we can maintain a cohesive operational environment.	LOW	Type Key Summary SCRUM-33 Integration with E 1 item Synced just now

🎨 User interaction and design



General Workflow Diagram

Open Questions

Question	Answer	Date Answered
How will the system handle potential network outages or connectivity issues?	The system should implement a local fallback mechanism. IoT devices can be programmed to operate based on the last known good settings in case of network failure. Additionally, implementing a local cache on a gateway device can help maintain basic functionality and data logging during short-term outages.	Oct 5, 2024
What measures will be in place to ensure data security and privacy?	The system should employ end-to-end encryption for all data transmissions. User authentication and authorization protocols should be implemented for access control. Regular security audits and updates should be conducted. Additionally, data anonymization techniques can be used for any data shared for analysis or reporting purposes.	Oct 12, 2024
How scalable is the system for larger greenhouse operations or multiple locations?	The system architecture should be designed with scalability in mind. Using cloud-based services for data storage and processing can allow for easy scaling. The central system should be able to manage multiple greenhouse instances, each with its own set of IoT devices. Load balancing and distributed computing techniques can be employed to handle increased data volume and processing requirements.	Oct 18, 2024
What is the plan for system updates and maintenance?	Regular software updates should be scheduled during off-peak hours to minimize disruption. A staged rollout approach can be used to test updates on a small scale before full deployment. For hardware maintenance, the system should support hot-swappable components where possible. A regular maintenance schedule should be established, with procedures for both routine checks and emergency repairs.	Oct 25, 2024
How will the AI models be trained and updated over time?	Initial AI models will be trained on historical greenhouse data and agricultural best practices. As the system collects more data, periodic retraining can be scheduled to improve model accuracy. Transfer learning techniques can be employed to adapt models to different crops or environmental conditions. A feedback loop should be implemented to incorporate expert knowledge from	Nov 2, 2024

	greenhouse managers into model improvements.	
What kind of user customization will be available in the system?	Users should be able to set custom alerts and notifications based on their specific needs. The dashboard interface should be customizable, allowing users to prioritize the information most relevant to them. Advanced users could be given the option to adjust AI recommendation thresholds or even implement custom control algorithms within a safe operating range.	Nov 9, 2024
How will the system handle conflicting data or sensor failures?	The system should implement data validation algorithms to detect anomalies or conflicting readings. Redundant sensors for critical measurements can provide backup and verification. If conflicts or failures are detected, the system should alert users and fall back to conservative settings to ensure crop safety. Machine learning techniques can also be used to predict or interpolate missing data in case of sensor failure.	Nov 16, 2024
What kind of reporting and analytics capabilities will be available?	The system should offer a range of reporting options, from real-time dashboards to detailed historical analyses. Users should be able to generate custom reports based on specific date ranges, crop types, or environmental factors. Predictive analytics could be incorporated to forecast yields or resource usage. Integration with common business intelligence tools could also be considered for advanced users.	Nov 23, 2024
How will the system integrate with existing agricultural management software?	The system should offer standard APIs for data exchange with common farm management software. Custom integrations can be developed for specific client needs. Data export in standard formats (CSV, JSON) should be available for manual integration. Consider partnering with major agricultural software providers to develop seamless integrations.	Nov 30, 2024
What is the disaster recovery plan for the system?	A comprehensive backup strategy should be implemented, including regular backups of all system data and configurations. Cloud-based redundancy can ensure data availability in case of local hardware failure. A detailed disaster recovery plan should be documented, including procedures for various scenarios (power outage, natural disasters, cyber	Dec 7, 2024

	attacks). Regular drills should be conducted to ensure the effectiveness of the recovery plan.	

⚠️ Out of Scope

- **Drone Integration for Aerial Monitoring and Pesticide Application**
  Status: Out of Scope
  Reason: Not suitable for indoor environments, regulatory complexities, safety concerns
  Potential Future Consideration: May be explored for outdoor farming solutions

- **Genetic Modification Integration**
  Status: Out of Scope
  Reason: Beyond the scope of an IoT control system, requires specialized biotechnology
  Potential Future Consideration: Unlikely due to specialized nature

- **Automated Robotic Harvesting System**
  Status: Revisit in Later Release
  Reason: Current focus is on growing conditions; harvesting adds significant complexity
  Potential Future Consideration: High priority for future development to reduce labor costs

- **Marketplace Integration for Direct Crop Sales**
  Status: Out of Scope
  Reason: Focus is on production, not distribution; involves complex e-commerce elements
  Potential Future Consideration: Possible partnership with existing agricultural marketplaces

- **Virtual Reality (VR) Interface for Remote Greenhouse Tours**
  Status: Out of Scope
  Reason: Not essential for greenhouse operations, requires additional hardware
  Potential Future Consideration: May be explored as an educational or marketing tool

- **Blockchain Integration for Crop Traceability**
  Status: Revisit in Later Release
  Reason: Current focus is on production efficiency; traceability is secondary priority
  Potential Future Consideration: High potential for improving supply chain transparency

- **Energy Production (e.g., Solar Panels) Management**
  Status: Out of Scope
  Reason: Focus is on crop management, not energy production
  Potential Future Consideration: May be integrated for sustainability initiatives

- **Automated Pest Recognition and Targeted Treatment**
  Status: Revisit in Later Release
  Reason: Requires advanced image recognition capabilities beyond current scope
  Potential Future Consideration: High priority for reducing pesticide use and improving crop health

- **Integration with Weather Forecasting Services**
  Status: Revisit in Later Release
  Reason: Indoor environment is controlled; external weather less critical
  Potential Future Consideration: Useful for energy efficiency and planning outdoor activities

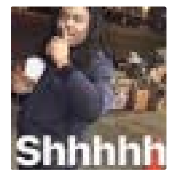
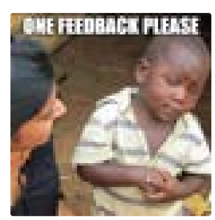
- **Multi-language Support and Localization**
  Status: Revisit in Later Release
  Reason: Initial release focused on primary market language
  Potential Future Consideration: High priority for expanding into international markets

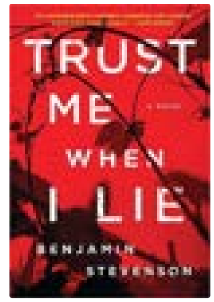
- **Machine Learning for Crop Yield Prediction**
  Status: Revisit in Later Release
  Reason: Requires substantial historical data; focus is on real-time management for initial release
  Potential Future Consideration: High value for long-term planning and resource allocation

- **Integration with Smart Home/Building Systems**
  Status: Out of Scope
  Reason: Focus is on professional agricultural use, not consumer applications
  Potential Future Consideration: Possible for small-scale or urban farming initiatives

Team member profiles

🤡 Dang Duy's profile

Environments I like to work in	• Quiet environment with sufficient lighting • Shared Workspaces • Limited Distractions	
Preferred working hours	• 7 A.M. - 12 P.M.	
Communication preferences	• Gmail or Zalo for Online Meetings • Offline Meeting	
Preferred ways to receive feedback	Directly with constructive feedback and suggestions	
Things I need	• Receiving feedback from others to ensure I'm producing my best work. • Supportive teammates. • Useful tools to use.	
How I learn best	• My optimal learning style involves actively engaging in practical, hands-on experiences, such as conducting experiments or	

	applying theoretical knowledge in real-world situations. • I benefit from using visual aids, including charts, diagrams, infographics, mind maps, and flowcharts, to help organize and represent abstract ideas and information. • Explicit instructions and concrete examples are essential for guiding my understanding. Additionally, opportunities for feedback and reflection enhance my skills and comprehension. • I perform best under pressure and deadlines, finding motivation in the urgency to complete tasks efficiently. • I’m always open to learning, and contributing to my personal growth and development.	
Things I struggle with	• I sometimes find certain aspects of this project challenging, such as managing complex problem-solving tasks, balancing different responsibilities, or adapting to unexpected issues. These difficulties can be overwhelming at times, but I’m working on strategies to address them.	
Things I love	• Wealth. • Fame. • Power. • @CONG HUNG PHAN	
If I were an animated gif/meme/animal/song, I would be...		
My favorite saying	My heart is so full of you that I can hardly call it my own.	

		
Other things I want you to know	I am a lazy person, willing to	

For a facilitation guide and more info on running this play with your team, visit https://www.atlassian.com/team-playbook/plays/my-user-manual

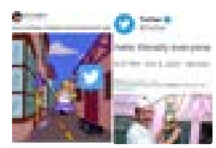
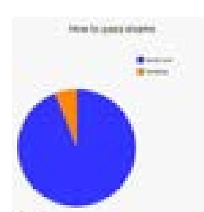
Cong Hung's profile

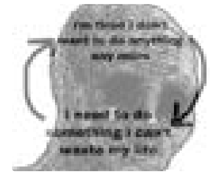
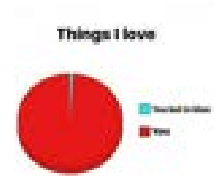
Environments I like to work in	• Comfortable • No noise • A headphone and music	
Preferred working hours	12 P.M - 12 A.M	
Communication preferences	• Find me on Messenger, Zalo, and Microsoft Teams (for online meetings)	
Preferred ways to receive feedback	• Directly message through Messenger	
Things I need	• Knowledge • Money 💸	 me fr
How I learn best	• In my favorite coffee shop ☕	
Things I struggle with	• Be a successful person	
Things I love	• My family 👪 • Good music • Valorant (a FPS game) • Wuthering Waves (a gambling game) • @NGUYEN DANG DUY LE	
If I were an animated gif/meme/animal/song, I would be...		
My favorite saying	Just do it!	

Other things I want you to know about me	I am addicted to music and video games which I can play for many hours straight	

For a facilitation guide and more info on running this play with your team, visit https://www.atlassian.com/team-playbook/plays/my-user-manual

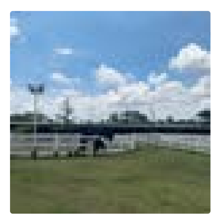
Minh Duy's profile

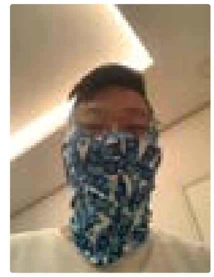
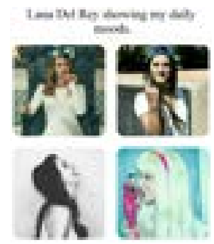
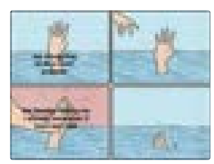
Environments I like to work in	• Net Shop • Coffee Shop • Dang Duy's House	
Preferred working hours	9 A.M. - 9.30 P.M (after 9.30PM iz Valorantz Time) later if close dealine	
Communication preferences	Telegram and X ;> Messenger (daily conversation)	
Preferred ways to receive feedback	Direct, immediate, and clear feedback to make quick improvements	
Things I need	Receiving feedback from others to ensure I'm producing my best work.	
How I learn best	HD Motivation, Lesson Plan, Detailed Statistic and Schedule.	

Things I struggle with	Bunch of Timeline and Deadline to Deal With	
Things I love	Study, Playing, Eating, and Chillin.	
If I were an animated gif/meme/animal/song, I would be...	 Me	
My favorite saying	“The best Investment you can make is in yourself..” - Warren Buffett	
Other things I want you to know about me	I'm Broke 😞	

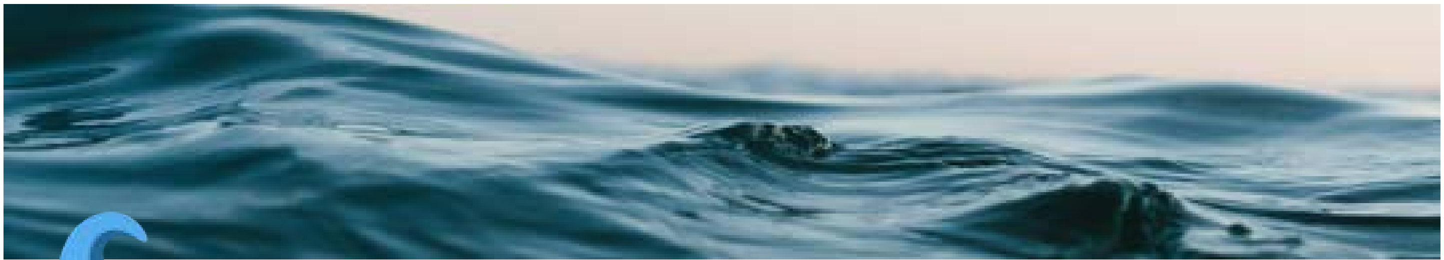
ℹ For a facilitation guide and more info on running this play with your team, visit https://www.atlassian.com/team-playbook/plays/my-user-manual

Phuong Anh's profile

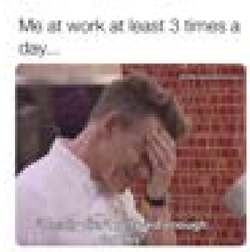
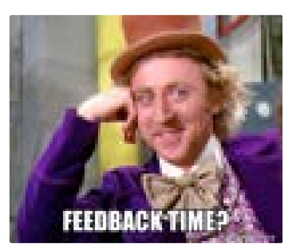
Environments I like to work in	• Supportive • Collaborative • Flexible (Places and time) • Have their own spaces	
Preferred working hours	8A.M - 5P.M	
Communication preferences	I prefer face - to - face conversation but Zalo, Gmail and Meets is ok in case not showing up in office.	
Preferred ways to receive feedback	Directly texts, before 5P.M. Urgent cases through emails.	
Things I need	I need my own space because I'm an introverts, also a panic room. Outdoor activities are the best.	 My CLB activity **happy - ing**
How I learn best	I love mathematics and graphs. Just give me those, I will kill them all.	
Things I struggle with	It's hard for me to collapse with new people. I need a lengthy period of time to get used to them.	

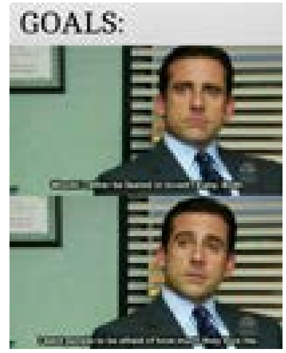
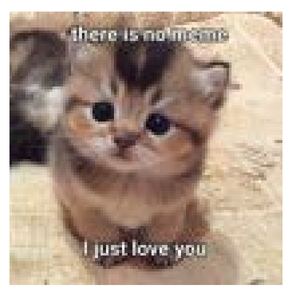
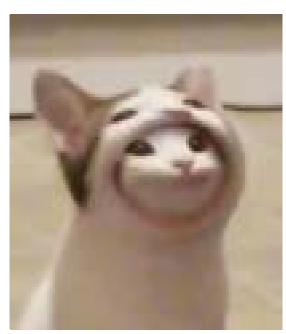
Things I love	@LE TRUONG THIEN NGUYEN and my collection of romance books.	 Him
If I were an animated gif/meme/animal/song, I would be...	Queen Lana Del Ray with all her songs. Deep and emotional.	
My favorite saying	I slay effortlessly, whether it's goals or snack time!	 This is also me
Other things I want you to know about me	Potential to do math.	

For a facilitation guide and more info on running this play with your team, visit https://www.atlassian.com/team-playbook/plays/my-user-manual



Truong Thien's profile

Environments I like to work in	Structured, collaborative environments with clear communication and well-defined workflows.	
Preferred working hours	Standard office hours (7 AM - 7 PM), but flexible as needed based on project requirements.	
Communication preferences	Direct and efficient communication via Microsoft Teams and Zalo for quick updates.	
Preferred ways to receive feedback	Constructive feedback through messages, emails, or during regular project check-ins.	
Things I need	Clear goals, a well-defined timeline, and open channels of	

	communication with my team.	
How I learn best	Hands-on experience, practical problem-solving, and learning through feedback.	
Things I struggle with	Delegating tasks without being fully involved; managing ambiguity in project expectations.	
Things I love	Watching movies, playing games, and occasionally enjoying music. That’s something someone gonna say, for me, my family and girlfriend @MINH PHUONG ANH MAI are everything.	
If I were an animated gif/meme/animal/song, I would be...	A peaceful cat, full of optimism and laziness, like there’s nothing to care about.	 Cute?
My favorite saying	"It's okay to be wrong, for even a broken clock finds truth twice a day."	

		
Other things I want you to know about me	I am addicted to “gacha”.	 A Qiqi or not?

Meeting notes in space

Create meeting note

Incomplete tasks from meetings

Description	Due date	Assignee	Task appears on
☐ Finalize the UI/UX design			29/10/2024 Meeting notes

Decisions from meetings

Page Title	Decisions
16/09/2024 Meeting Notes	@LE TRUONG THIEN NGUYEN : Project Manager @NGUYEN DANG DUY LE : Software Engineer @CONG HUNG PHAN : AI Specialist @MINH PHUONG ANH MAI : Data Engineer @MINH DUY NGUYEN UI/UX Designer
18/09/2024 Meeting Notes	Adjust the project timeline by extending deadlines for each team member's tasks. This will allow for more thorough development and improve collaboration, ultimately enhancing the quality of the work and the project's success. Reduce unforeseen challenges by gathering input from all team members. This collaboration fosters open communication, helping to identify potential issues early and develop proactive solutions, ultimately strengthening the project's success.
20/09/2024 Meeting notes	Select Elon Musk, Scott Angle, and Thomas Hooft as our key personas for this project.

	Create the initial empathy map internally based on thorough research and analysis, and then engage stakeholders to gather their feedback for refinement. Each map should outline their thoughts, feelings, actions, pain points, and aspirations, guiding the team in developing user-centered designs that address their needs and challenges.
23/09/2024 Meeting notes	We've decided to regularly update our application to optimize performance and enhance the user experience. These updates will focus on refining features, improving usability, and responding to user feedback. It's important to integrate this into our project requirements to ensure that the app stays relevant and continually meets user needs. We'll also monitor user interaction and make adjustments based on real-world usage to ensure the app remains intuitive and efficient for all personas.
25/09/2024 Meeting notes	Agreed to submit status updates every week. Changes to scope require team approval.

All meeting notes

Title	Creator	Modified
06/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 11, 2024
04/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 11, 2024
02/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 11, 2024
09/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 10, 2024
08/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 10, 2024
07/11/2024 Meeting notes	MINH PHUONG ANH MAI	Nov 10, 2024
05/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 10, 2024
01/11/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 10, 2024
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29/10/2024 Meeting notes	MINH PHUONG ANH MAI	Nov 10, 2024
25/10/2024 Meeting notes	MINH PHUONG ANH MAI	Nov 10, 2024
20/10/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 10, 2024
02/10/2024 Meeting notes	MINH PHUONG ANH MAI	Nov 10, 2024
03/11/2024 Meeting notes	MINH PHUONG ANH MAI	Nov 09, 2024
27/10/2024 Meeting notes	NGUYEN DANG DUY LE	Nov 07, 2024
19/10/2024 Meeting notes	MINH PHUONG ANH MAI	Oct 20, 2024
07/10/2024 Meeting notes	CONG HUNG PHAN	Oct 19, 2024
16/10/2024 Meeting notes	MINH PHUONG ANH MAI	Oct 19, 2024

09/10/2024 Meeting notes	MINH PHUONG ANH MAI	Oct 09, 2024
27/09/2024 Meeting notes	NGUYEN DANG DUY LE	Sept 28, 2024

Find more results

16/09/2024 Meeting Notes

Date

Sep 16, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH DUY NGUYEN
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH PHUONG ANH MAI

Goals

- Assign roles and responsibilities to each member
- Assign tasks: Providing materials needed for launching the project

Discussion topics

Time	Topic	Presenter	Notes
20:00	Roles Assignment	• @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI • @MINH DUY NGUYEN • @NGUYEN DANG DUY LE • @CONG HUNG PHAN	• Introduce the roles each member will take on based on skills, project needs, and preferences. • Explain the responsibilities of each role in relation to the project milestones. • Facilitate a group discussion to ensure members are comfortable with their assigned roles and clear on their scope. • Allow each team member to briefly outline how their role contributes to the project's success.
20:30	Task Distribution	• @LE TRUONG THIEN NGUYEN	• Review the project timeline and break down the key tasks and deliverables. • Assign specific tasks to each team member, ensuring tasks align with roles and strengths.

		• @MINH PHUONG ANH MAI • @MINH DUY NGUYEN • @NGUYEN DANG DUY LE • @CONG HUNG PHAN	• Set expectations for task completion timelines and clarify any potential bottlenecks or dependencies. • Discuss collaboration tools (e.g., Jira, Trello) for task tracking and updates, ensuring everyone is comfortable with them. • Plan regular check-ins to review progress, address challenges, and provide support where needed.
21:00	Team agreement	• @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI • @MINH DUY NGUYEN • @NGUYEN DANG DUY LE • @CONG HUNG PHAN	• Finalize a team agreement outlining communication protocols, decision-making processes, and conflict resolution strategies. • Define preferred communication tools (e.g., Microsoft Teams, Zalo, Gmail) and set response time expectations (e.g., within 24 hours). • Discuss availability and set clear working hours, ensuring everyone's schedule is respected. • Outline a feedback and review process for both positive and constructive feedback, ensuring it's a key part of the project workflow. • Agree on the decision-making hierarchy: who makes final decisions in case of disagreements.

✅ Action items

- [x] Assign project roles to team members.
- [x] Allocate tasks to each team member based on their roles.
- [x] Finalize the team agreement.

Decisions

Roles Assigned:

@LE TRUONG THIEN NGUYEN : Project Manager

@NGUYEN DANG DUY LE : Software Engineer

@CONG HUNG PHAN : AI Specialist

@MINH PHUONG ANH MAI : Data Engineer

@MINH DUY NGUYEN UI/UX Designer

Task Assigned:

- **Prepare Risk Assessment and Project Plan for September 18 Meeting**
  - **Risk Assessment**:
    - Identify and categorize potential project risks.
    - Provide mitigation strategies for each risk.
    - Highlight dependencies and critical factors.

- **Project Plan**:
  - Outline key milestones, deliverables, and timelines.
  - Specify task ownership and dependencies.
  - Include visual aids (e.g., Gantt charts) for clarity.

18/09/2024 Meeting Notes

📅 Date

Sep 18, 2024

👥 Participants

- @NGUYEN DANG DUY LE
- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @MINH DUY NGUYEN

🥅 Goals

- Conduct a detailed risk assessment, identifying potential risks and outlining mitigation strategies.
- Develop a comprehensive project plan, outlining key objectives, timelines, and resource allocation.

🗣️ Discussion topics

Time	Item	Presenter	Notes
19:30	Comprehensive Risk assessment	• @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI	Perform a comprehensive risk assessment by identifying potential risks and outlining mitigation strategies. Include an analysis of each risk's likelihood and impact and actions to reduce or manage these risks effectively.
20:00	Project Plan	• @CONG HUNG PHAN • @MINH PHUONG ANH MAI • @NGUYEN DANG DUY LE	Present a clear project plan that outlines key objectives, timelines, and resource allocation. It should cover essential tasks, assign responsibilities, and ensure effective use of resources to meet project goals on time.

		• @MINH DUY NGUYEN • @LE TRUONG THIEN NGUYEN	

Action items

- [x] Set timelines for each phase of the project.
- [x] Conduct a risk assessment and develop mitigation strategies.
- [x] Present the project plan, outlining objectives and deliverables.
- [x] Assign tasks and responsibilities to team members based on the timeline.

Decisions

- Adjust the project timeline by extending deadlines for each team member's tasks. This will allow for more thorough development and improve collaboration, ultimately enhancing the quality of the work and the project's success.
- Reduce unforeseen challenges by gathering input from all team members. This collaboration fosters open communication, helping to identify potential issues early and develop proactive solutions, ultimately strengthening the project's success.

20/09/2024 Meeting notes

Date

Sep 20, 2024

Participants

- @CONG HUNG PHAN
- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @MINH DUY NGUYEN
- @NGUYEN DANG DUY LE

Goals

- Create three key personas representing different user groups. Each persona should detail their characteristics, needs, and challenges, guiding development to ensure the product meets the diverse requirements of its target audience.
- Create Empathy Maps for each persona to understand their experiences.

Discussion topics

Time	Topic	Presenter	Notes
20:00	Research Personas	• @MINH DUY NGUYEN • @NGUYEN DANG DUY LE • @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI • @CONG HUNG PHAN	Identify the appropriate personas for the project. This involves understanding the different user groups, stakeholders, or customer segments that will interact with or be impacted by the project. These personas should be based on a thorough examination of their demographics, needs, behaviors, goals, challenges, and motivations.
21:00	Empathy Map	• @CONG HUNG PHAN	Once these personas are clearly defined, the next step is creating an empathy map for each one. By mapping these elements, our team can better

		@MINH PHUONG ANH MAI @LE TRUONG THIEN NGUYEN @MINH DUY NGUYEN @NGUYEN DANG DUY LE	understand each persona's perspective, ensuring that the solutions developed are truly user-centered and resonate with unique needs and expectations.

Action items

- [x] Provide a concise overview of the three key personas within the project.
- [x] Complete the Empathy Map for each persona.
- [x] Define and clarify the entities, stakeholders, and personas involved in the project.
- [x] Finalize the Entity Relationship Diagram (ERD).

Decisions

- Select Elon Musk, Scott Angle, and Thomas Hooft as our key personas for this project.
- Create the initial empathy map internally based on thorough research and analysis, and then engage stakeholders to gather their feedback for refinement.
- Each map should outline their thoughts, feelings, actions, pain points, and aspirations, guiding the team in developing user-centered designs that address their needs and challenges.

23/09/2024 Meeting notes

📅 Date

Sep 23, 2024

👥 Participants

- @CONG HUNG PHAN
- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @MINH DUY NGUYEN
- @NGUYEN DANG DUY LE

🥅 Goals

- Identify product requirements based on the project plan, stakeholders' feedback, and resources.
- Ensure that everyone involved in the project understands what the product needs to accomplish.

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00	Project requirement	• @LE TRUONG THIEN NGUYEN • @CONG HUNG PHAN • @MINH PHUONG ANH MAI • @NGUYEN DANG DUY LE • @MINH DUY NGUYEN	• Project requirements need to cover all the essentials to keep us on track. • The objective should clearly outline what we want to achieve, making sure it's aligned with user needs (like improving greenhouse efficiency or increasing tech adoption). • For success metrics, we created measurable outcomes, like user engagement, crop yield increases, or resource savings. • We have listed our assumptions about user behavior, technology readiness, and market conditions, and be sure to revisit these as we go. • Milestones will mark key phases (development, testing, launch) to ensure progress is steady and measurable.

			• Lastly, user interaction and design are critical, our design needs to be intuitive for all personas, so continuous testing and iteration based on feedback will be key to ensuring adoption and usability.

✅ Action items

In Product Requirements:

- [x] Define the Project objective.
- [x] Confirm measurable goals.
- [x] Set dates and checkpoints for key deliverables.

Decisions

- We've decided to regularly update our application to optimize performance and enhance the user experience. These updates will focus on refining features, improving usability, and responding to user feedback. It's important to integrate this into our project requirements to ensure that the app stays relevant and continually meets user needs.
- We'll also monitor user interaction and make adjustments based on real-world usage to ensure the app remains intuitive and efficient for all personas.

25/09/2024 Meeting notes

📅 Date

Sep 25, 2024

👥 Participants

- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @MINH DUY NGUYEN

🥅 Goals

- Finalize all project documents and diagrams, ensuring every detail is accurately captured and organized.
- Remind the team of our definition of "Finished," provide an overall project view, and emphasize supporting and connecting with one another throughout the process.

🗣 Discussion topics

Time	Item	Presenter	Notes
20:00		• @CONG HUNG PHAN • @NGUYEN DANG DUY LE • @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI • @MINH DUY NGUYEN	• Reinforce the importance of staying connected and informed throughout all phases of the project. • Ensure regular updates via team meetings, status reports, or collaboration tools. • Present a clear summary of the project's current status, including key milestones achieved and remaining tasks. • Review the overall objectives and goals to ensure the team remains focused on the end result. • Highlight any changes in scope, timelines, or priorities that impact the project. • Reiterate the criteria we agreed upon for considering a task or deliverable complete.

21:00		• @CONG HUNG PHAN • @NGUYEN DANG DUY LE • @LE TRUONG THIEN NGUYEN • @MINH PHUONG ANH MAI • @MINH DUY NGUYEN	• Review all diagrams to confirm they reflect the current state of the project and processes. • Ensure any required feedback or revisions have been incorporated before obtaining final approval. • Label each file clearly, with version control where necessary, to track revisions. • Ensure all components, relationships, and workflows are accurately represented.

✅ Action items

- [x] Regular updates via meetings and status reports.
- [x] Present milestones achieved and remaining tasks.
- [x] Highlight changes in scope or timelines.
- [x] Ensure diagrams are up-to-date with version control.

⤴ Decisions

- Agreed to submit status updates every week.
- Changes to scope require team approval.
- Diagrams must be reviewed before final approval.

27/09/2024 Meeting notes

📅 Date

Sep 27, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Professionalize the Project report.
- Enhance Diagrams

🗣️ Discussion topics

Time	Item	Presenter	Notes
13:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	• Schedule a meeting with the mentor promptly to address and resolve any minor project issues. • Conduct an overall project review and identify any minor omissions or missing elements

✅ Action items

- [x] Complete project review

- [x] Identify missing components
- [x] Document findings
- [x] Address omissions
- [x] Final review

Decisions

02/10/2024 Meeting notes

Date

Sep 27, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

Goals

- Professionalize the Project report.
- Enhance Diagrams

Discussion topics

Time	Item	Presenter	Notes
13:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	• Schedule a meeting with the mentor promptly to address and resolve any minor project issues. • Conduct an overall project review and identify any minor omissions or missing elements

Action items

- [x] Complete project review

- [x] Identify missing components
- [x] Document findings
- [x] Address omissions
- [x] Final review

Decisions

07/10/2024 Meeting notes

Date

Oct 7, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

Goals

- Plan on creating an updated Entity-Relationship Diagram (ERD) and Data Flow Diagram (DFD) to better represent the system's architecture and workflow.
- Setting the stage for progress.
- Review the current system design and identify areas for improvement, particularly in terms of functionality and efficiency.

Discussion topics

Time	Item	Presenter	Notes
20:00	ERD, DFD	@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Plan Update for ERD: • Discussed the need to revise the ERD to reflect recent changes in the system's data structures and relationships. This will include updating entities, attributes, and relationships to ensure consistency with the current implementation. Make Data Flow Diagram (DFD): • Agreed on creating a detailed DFD to map out the system's data flow from input to output. The DFD will help visualize how data moves between processes, storage, and users. It will also highlight areas for improvement in the system's process flow and efficiency.

21:00	Review the current system design	@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Review Current System: • Reviewed the current system architecture and functionality. Identified key areas that need attention, including database schema adjustments, process improvements, and any potential bottlenecks in the system workflow.

✅ Action items

- [x] Draft a DFD outlining the system's data flow processes
- [x] Preparing for change
- [x] Review the current system architecture and document areas for improvement

⤴ Decisions

09/10/2024 Meeting notes

Date

Oct 9, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

Goals

- Checking the team's dynamics, workload, and communication to identify any issues affecting morale or performance, ensuring a productive and positive work environment
- Review and update all Jira tasks, ensuring they are properly assigned, prioritized, and detailed with clear deadlines and dependencies to keep the project on track.

Discussion topics

Time	Item	Presenter	Notes
20:00	Trello Board	@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	• Created Team Health Monitor on Trello ◦ Tracks team dynamics and engagement ◦ Monitors collaboration and progress ◦ Provides issue escalation mechanism
21:00	Jira Timeline	@LE TRUONG THIEN NGUYEN	• Finalized sprint on Jira Timeline ◦ Prioritized tasks assigned to team members ◦ Set clear deadlines for each task

		@MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	◦ Reviewed backlog items for future sprints

✅ Action items

- [x] Join Trello
- [x] Analyze our Team Health Monitors
- [x] Update Jira tasks

⤴ Decisions

16/10/2024 Meeting notes

📅 Date

Oct 16, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Modifying the ERD diagram into Context, Logical, and Physical parts enhances clarity and organization.
- Incorporate a Data Flow Diagram (DFD) into the project to visually represent the flow of data within the system.

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	The Context section offers an overview of the system's interactions and boundaries. The Logical section details the database structure, including entities, attributes, and relationships, reflecting business rules without technical specifics. The Physical section translates this structure into a working database with tables, columns, and data types. Adding a DFD visually represents data flow within the system and interactions between entities.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI	This diagram will illustrate how data moves between different processes, external entities, and data stores, helping to clarify the interactions and relationships within the system.

		@NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	

Action items

- [x] ERD diagram modified
- [x] Adding DFD diagram

Decisions

19/10/2024 Meeting notes

📅 Date

Oct 19, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Conduct a comprehensive review of the team's progress report, thoroughly evaluating the challenges faced and the overall performance of each team member throughout the Sprint 1 period. Provide detailed feedback on their contributions, addressing both the obstacles encountered and the effectiveness of their efforts.
- Perform a final review of the ERD across all stages: Conceptual, Logical, and Physical, ensuring accurate system representation and readiness for implementation. Also, check the DFD Level 0 to confirm all key processes, data stores, and flows are correctly depicted.

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	1. **Team Performance Overview:** ◦ Overall progress is on track, with the majority of tasks completed as scheduled. ◦ Team members have been consistently contributing, though some bottlenecks were identified in specific areas. ◦ Communication among members has been generally effective, but could be improved during task hand-offs. 2. **Identified Difficulties:** ◦ **Technical Challenges:** Some team members encountered issues with certain tools or technologies, particularly during the integration of systems. ◦ **Task Prioritization:** There was some confusion around prioritizing tasks, leading

			to delays in high-impact areas. ◦ **Time Management:** A few team members struggled with balancing their workload, leading to delays in their individual tasks. 3. **Individual Team Member Performance:** ◦ **Member A:** Performed consistently and took a proactive approach to troubleshooting technical challenges. ◦ **Member B:** Experienced delays due to technical issues but recovered well after seeking help. ◦ **Member C:** Needs to improve task prioritization and time management; fell behind schedule on a few tasks but caught up towards the end. ◦ **Member D:** Excellent communication and supported other team members effectively. Completed tasks ahead of schedule. 4. **Feedback Given:** ◦ Encouraged the team to improve **time management** and communicate challenges earlier to prevent bottlenecks. ◦ Provided positive feedback for **problem-solving** and teamwork displayed during challenging tasks. ◦ Suggested more **frequent check-ins** to align on priorities and ensure smoother task transitions. ◦ Recommended further **training on tools** for those struggling with technical issues to avoid future delays. 5. **Next Steps for Sprint 2:** ◦ Implement improved **task prioritization** and **time management** strategies. ◦ Set up additional **training sessions** to address technical difficulties. ◦ Continue fostering **collaboration** and **open communication** across all team members. ◦ Monitor team dynamics and performance, ensuring progress remains steady.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN	1. **ERD Review:** ◦ **Conceptual Stage:** ▪ Ensured that all key entities, external systems, and relationships are clearly defined and align with the project's high-level requirements. ▪ Verified that system boundaries and interactions are accurately represented, reflecting the overall scope of the system.

		@MINH DUY NGUYEN	◦ **Logical Stage:** ▪ Checked that all entities, attributes, and relationships are correctly mapped according to business rules. ▪ Reviewed the structure for consistency, ensuring primary keys, foreign keys, and constraints are properly applied to reflect the data model. ◦ **Physical Stage:** ▪ Confirmed that the physical implementation details, including tables, columns, data types, and indexes, are accurately detailed and ready for database setup. ▪ Reviewed technical components for performance considerations and optimization (e.g., indexing strategies). 2. **DFD Level 0 Review:** ◦ **Key Processes:** ▪ All main processes are depicted, showing how data is processed and transferred between the system and external entities. ◦ **Data Stores:** ▪ Verified that all required data stores are included, with correct relationships and dependencies outlined. ◦ **Data Flows:** ▪ Checked that data flows between processes, external systems, and data stores are clearly illustrated, ensuring no steps are missing. ▪ Ensured that all data input/output is properly linked and flows logically through the system. 3. **Final Confirmation:** ◦ Ensured that the ERD and DFD Level 0 provide a comprehensive and accurate representation of the system. ◦ Verified that both diagrams are aligned with each other and ready for implementation in the next phase of the project. ◦ Finalized the documents for handoff to the development team, ensuring all necessary corrections have been made.

✅ Action items

- [x] Final Check
- [x] Give feedbacks, report progress and update new version of project proposal

Decisions

20/10/2024 Meeting notes

📅 Date

Oct 20, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- **Complete and finalize the Progress Report** to provide an accurate overview of project status and achievements.
- **Conduct a comprehensive review of all progress** to assess strategies, challenges, and solutions implemented thus far.
- **Develop and finalize the Level 2 Entity-Relationship Diagram (ERD) and Level 0 Data Flow Diagram (DFD)** to clearly illustrate data entities and flows within the project.

Time	Item	Presenter	Notes
19:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	**Progress Review Overview:** Overall progress is on track, with the Progress Report nearing completion, reflecting key achievements and milestones. Team members have actively contributed, though some challenges have emerged in specific areas, particularly regarding strategy implementation. Communication among team members has been effective, but there is room for improvement during task transitions.
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI	**Diagram Completion Overview:** The completion of the Level 2 Entity-Relationship Diagram (ERD) and Level 0 Data Flow Diagram (DFD) marks a significant milestone in the project, providing clear visual representations of data

		@NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	entities and flows. These diagrams serve as essential tools for understanding the structure and interaction of data within the system.

Action items

- [x] Finalize the Progress Report.
- [x] Review and provide feedback on the project's progress.
- [x] Update the project proposal with the latest information
- [x] Create Level 0 Data Flow Diagram (DFD).
- [x] Schedule a team meeting to discuss project updates.
- [x] Compile and organize all relevant documentation.
- [x] Prepare a summary of changes made in the project proposal.
- [x] Share the updated proposal with stakeholders for review.

Decisions

25/10/2024 Meeting notes

📅 Date

Oct 25, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Review all tasks of Final Report and Product Deliverables (Week 12)
- Generate ideas for tasks
- Assign tasks to team members

Time	Item	Presenter	Notes
19:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We review all tasks outlined in the final report and product deliverables for Week 12 to ensure that the design of the IoT-controlled greenhouse system meets the required standards and project objectives. This focuses on confirming that the Jira workspace is working as intended and that the user interface and training protocols align with the expectations in the assignment brief. We review each task and highlight the main ideas, focusing on their purpose and impact within the greenhouse system context. The discussion also touches on the user interface's importance for usability and the comprehensive data management system's role in ensuring efficiency and reliability.
20:00		@LE TRUONG THIEN NGUYEN	We brainstorm innovative approaches to fulfill each task and develop relevant sub-tasks. Ideas could include designing user-friendly dashboards, suggesting real-time notification systems for critical

		@MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	conditions, or adding detailed training modules for user support. Sub-tasks involve outlining testing protocols for data accuracy or creating sample case studies to illustrate potential system benefits. We also allocate tasks as though we are working in a team.

Action items

- [x] Review all tasks for Final Report and Product Deliverables (Week 12)
- [x] Team members received task
- [x] Discuss and highlight the main ideas for each task

Decisions

27/10/2024 Meeting notes

📅 Date

Oct 27, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Develop a clear understanding of the UI/UX design.
- Gain insight into the Greenhouse UI/UX components from a client's perspective.

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	To build a strong foundation for the UI/UX design of the greenhouse system, we need to focus on several core design principles aimed at clarity, accessibility, and functionality. The UI should prioritize a clean layout with intuitive navigation, ensuring users can locate and interact with essential features effortlessly. Data visualization is key in a greenhouse system; the interface should present real-time data in understandable formats such as graphs, gauges, or charts. These visual aids enable users to quickly assess greenhouse conditions without needing to interpret raw data. The system should offer clear feedback whenever users make changes or interact with the interface, such as confirmation messages for actions or color changes indicating updated data. Customization options, such as setting alert preferences or adjusting dashboard layouts, further enhance the

			user experience by allowing users to tailor the interface to their specific needs. Lastly, accessibility features, including high-contrast visuals and alternative text for screen readers, ensure that the design can be used by all users, regardless of ability.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Gaining insight into the greenhouse UI/UX components from a client's perspective involves examining what clients value most in their interactions with such a system. From a client's viewpoint, the UI/UX design of the greenhouse system should facilitate straightforward control, monitoring, and management of their greenhouse environment. A central dashboard acts as a control hub, displaying live temperature, humidity, CO2 levels, and light conditions in a clear and easily digestible format. Clients should be able to quickly gauge the current state of their greenhouse and understand any significant changes at a glance. An alert system is critical to client confidence, with customizable settings that let clients define thresholds for notifications, such as low soil moisture or excessive temperature variations. The system should send these alerts via push notifications, SMS, or email, ensuring that clients stay informed even when they're not directly interacting with the interface.

✅ Action items

- [x] Brainstorm ideas for UI/UX design.
- [x] Examine users for a deep insight into Greenhouse UI/UX.
- [x] Give feedback on ideas.

⤴ Decisions

29/10/2024 Meeting notes

📅 Date

Oct 29, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Continue to design the UI/UX design
- Enhance the user experience

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	As we continue to design the UI/UX for the greenhouse system, the focus shifts to refining the layout and interactivity to ensure users can accomplish tasks with minimal effort. This involves incorporating user feedback from prototype testing to make informed adjustments that improve navigation and clarity. For example, simplifying complex data panels into digestible, collapsible sections can declutter the main dashboard and allow users to focus on the most relevant information. Enhancing visual consistency across all pages with a unified color scheme and typography boosts recognition and reduces cognitive load. Interactive elements, such as hover effects or expandable menus, guide users smoothly through actions without overwhelming them. Accessibility should be integrated deeply into the design process, ensuring all interactive

			components are easy to use with keyboard navigation and voice commands.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	To enhance the user experience further, personalization and predictive insights become key features. Allowing users to customize their dashboard layout by rearranging widgets or choosing which data points to highlight creates a more tailored experience that meets individual preferences. Implementing AI-powered insights that suggest optimal environmental settings or alert users to potential issues before they arise adds proactive value. Additionally, integrating detailed tutorials and tooltips that can be toggled on or off helps both new and experienced users find the level of guidance they need. Ensuring that system updates or notifications are non-intrusive yet informative helps maintain focus on main tasks while keeping users informed of important changes. This overall attention to flexibility, customization, and subtle support contributes to a user experience that is intuitive, efficient, and empowering.

✅ Action items

- [x] Update task to enhance user experience
- [ ] Finalize the UI/UX design

Decisions

31/10/2024 Meeting notes

📅 Date

Oct 31, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Finalize the UI/UX design.

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	@NGUYEN DANG DUY LE writes meeting note.
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE	We finalize the UI/UX design by ensuring that every element is polished and ready for a seamless user experience. We conduct thorough user testing to identify and address any minor issues that could impact usability, guaranteeing that our system performs smoothly and responds quickly on both desktop and mobile platforms. We also double-check consistency in iconography, color schemes, and typography to strengthen

		@CONG HUNG PHAN @MINH DUY NGUYEN	brand identity and maintain an aesthetically coherent design. We add finishing touches such as refining the alert and notification system to be informative yet non-intrusive, allowing users to stay updated without feeling overwhelmed. We revisit the user onboarding process to confirm that our tutorials and help features are thorough and supportive while remaining unobtrusive. Our comprehensive documentation, user manuals, and accessible support resources are integrated directly within the interface to provide a quick reference whenever needed. With these final steps, we ensure that our UI/UX design offers a seamless, intuitive, and user-focused experience, enabling users to confidently and efficiently manage their greenhouse operations.
02:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	The meeting has ended.

✅ Action items

- [x] Finalize the UI/UX design

Decisions

01/11/2024 Meeting notes

📅 Date

Nov 1, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Implementing dummy data.
- Develop a strong understanding of advanced SQL for database management.

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We are trying to implement dummy data to simulate real-world conditions in our greenhouse system, but we are finding this process more challenging than expected. Setting up meaningful and realistic dummy data involves more than just creating placeholder information—it requires structuring data that mirrors potential inputs and outputs of the actual system, such as temperature, humidity, and CO2 levels. We are grappling with creating datasets that effectively test the full range of system functionalities, including data aggregation, real-time analysis, and predictive algorithm performance. Ensuring that our dummy data interacts properly with all UI/UX components for accurate user testing is proving to be a complex and time-consuming task.
21:00		@LE TRUONG THIEN NGUYEN	We are also striving to develop a strong understanding of advanced SQL to manage the

		@MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	backend database effectively, which is essential for handling large amounts of data generated by IoT sensors. However, we are struggling with mastering advanced SQL concepts such as complex joins, subqueries, etc. These skills are crucial for ensuring that our database operates efficiently and supports the real-time demands of the greenhouse system.

✅ Action items

- [x] Get started with dummy data
- [x] Understand advanced SQL for database operation

Decisions

02/11/2024 Meeting notes

📅 Date

Nov 2, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Finish tutorial 8 and discuss the answers.
- Making progress on inserting dummy data.

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	In Tutorial 8, we will engage with three use cases focused on database querying and updating. The aim is to apply design thinking principles to address stakeholder problems while considering ethical, professional, and technical aspects of database management. Throughout the tutorial, we will explore how to extract and update information within a database, gaining hands-on experience with query formulation and database modifications. The assessment is intended to help us improve our technical skills, such as data management and querying, and our ability to communicate and collaborate effectively in a professional setting. After completing the exercises, we will discuss our answers and reflect on how we approached each use case, ensuring we understand the concepts

			and can apply them independently in future projects. This tutorial will also allow us to explore project-related skills and identify the resources needed to manage data and solve complex problems successfully.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We are making good progress in inserting dummy data by carefully crafting and inserting synthetic data that accurately simulates the behavior of the IoT-controlled greenhouse system. We've been focusing on generating time-series data for key environmental variables like temperature, humidity, and CO2 levels, which are essential for testing the system's responses. Using Python and SQL scripts, we are automating this process to create data that fluctuates in a way that mirrors real-world conditions, while also ensuring that the data interacts smoothly with the system's UI/UX. By incorporating conditional logic into our data generation process, we can test a range of scenarios and edge cases, ensuring the system can handle dynamic changes without errors. This methodical approach is helping us refine the data and its integration with the system, ensuring we have realistic and reliable test data to support our development and troubleshooting efforts.

✅ Action items

- [x] Complete tutorial 8
- [x] Making progress with dummy data

Decisions

03/11/2024 Meeting notes

📅 Date

Nov 3, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Seeking the solution for the dummy data problem

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We are seeking a solution for our dummy data problem, which stems from creating realistic data that effectively simulates the environmental conditions and responses of the IoT-controlled greenhouse system. The main issue we face is generating data that accurately represents dynamic changes, such as fluctuating temperature, humidity, and CO2 levels while ensuring that it interacts seamlessly with our system's UI/UX for testing purposes. The challenge lies in making this dummy data complex enough to test all functionalities without overwhelming the system or skewing results.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI	To fix this problem, we are exploring various data generation tools and scripts that allow us to create synthetic yet realistic data sets. We are working on developing scripts in Python and SQL that can automate the creation of time-series data that

		@NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	mimics real greenhouse behavior. Additionally, we are incorporating conditional logic to make sure the data reacts in a way that aligns with expected environmental changes, ensuring comprehensive testing. We are also collaborating to cross-check data accuracy and validate its integration with the UI, so we can address potential issues in real-time during the implementation phase.

✅ Action items

- [x] Identify the problems with dummy data
- [x] Seeking the solutions

Decisions

04/11/2024 Meeting notes

📅 Date

Nov 4, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Review the initial tasks assigned to each team member.
- Learn advanced SQL for managing database operations.

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We carefully reviewed the initial tasks assigned to each team member to ensure clarity and alignment with the overall project goals. Each task was designed to leverage the strengths and expertise of individual team members while promoting collaboration. By reviewing these assignments, we identified potential overlaps or gaps in responsibilities and made adjustments to optimize team performance. This review also helped to reinforce deadlines and expectations, ensuring that everyone was aware of their specific contributions to the project. Regular check-ins were established to track progress and ensure that each team member had the resources and support needed to complete their tasks efficiently. This early review set the foundation for

			smooth collaboration and helped to keep the project on track.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	To effectively manage and manipulate the large datasets required for this project, we are still focusing on learning advanced SQL techniques to handle complex database operations. This includes mastering advanced querying techniques such as joins, subqueries, and window functions, which are essential for retrieving and analyzing data efficiently. Additionally, we are learning how to optimize database performance through indexing, normalization, and query optimization strategies. This advanced SQL knowledge allows us to create more efficient queries, manage larger datasets, and perform more sophisticated data manipulation tasks, which are crucial for the success of the project. As we continue to build our SQL expertise, we are better equipped to handle complex data relationships and ensure the smooth operation of the database as it grows.

✅ Action items

- [x] Review the initial tasks assigned to each team member.
- [x] Learn advanced SQL for managing database operations.

Decisions

05/11/2024 Meeting notes

📅 Date

Nov 5, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Learning and implementing SQL for databases.

🗣️ Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Learning and implementing SQL for databases involved understanding the fundamental concepts of database structures, query languages, and data manipulation techniques. We started by grasping the core elements such as tables, relationships, and primary keys, which set the groundwork for efficient data storage and retrieval.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI	We delved into writing basic SQL queries to select, insert, update, and delete data, progressively tackling more advanced functions like joins subqueries, and aggregations. Throughout the process, practical exercises helped reinforce our knowledge by applying queries to sample

		@NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	databases, ensuring a solid grasp of both theoretical and hands-on aspects. This approach not only enhanced our ability to manage data effectively but also prepared us for future projects that demand robust data management solutions.

Action items

- [x] Learning how to use SQL.
- [x] Trying to implement it into database system.

Decisions

06/11/2024 Meeting notes

Date

Nov 6, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

Goals

- Finish Tutorial 9.
- Assign new tasks and set deadlines.

Discussion topics

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	For Tutorial 9, we focused on improving database performance by exploring the use of indexes and determining their effectiveness in optimizing query execution. We began by analyzing the queries used in the system and identifying areas where performance could be improved, particularly with large datasets. After reviewing the queries, we experimented with creating indexes on specific columns that were frequently queried or involved in joint operations. We tested the impact of these indexes by running performance benchmarks, and comparing query execution times before and after the indexes were applied. This hands-on approach allowed us to evaluate whether the indexes improved query speed or if they caused unnecessary overhead. We also considered the trade-offs of indexing, such as

			increased storage requirements and slower write operations, ensuring that the indexes we implemented provided a balanced performance boost. By the end of the exercise, we had a deeper understanding of when and where to use indexes effectively to enhance database responsiveness.
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	To keep the project on track, we've assigned new tasks to each team member based on the current needs of the project and upcoming milestones. These tasks are designed to build on the progress we've already made while addressing areas that need further attention.

Action items

- [x] Finish Tutorial 9.
- [x] Assign new tasks and set deadlines.

Decisions

07/11/2024 Meeting notes

Date

Nov 7, 2024

Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

Goals

- Complete Major-specific work

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Each member completes their Major-specific work
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE	Meeting ended.

		@CONG HUNG PHAN @MINH DUY NGUYEN	

Action items

- [x] Each member completes their Major-specific work

Decisions

08/11/2024 Meeting notes

📅 Date

Nov 8, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Work on Process and Product Video (Week 12)

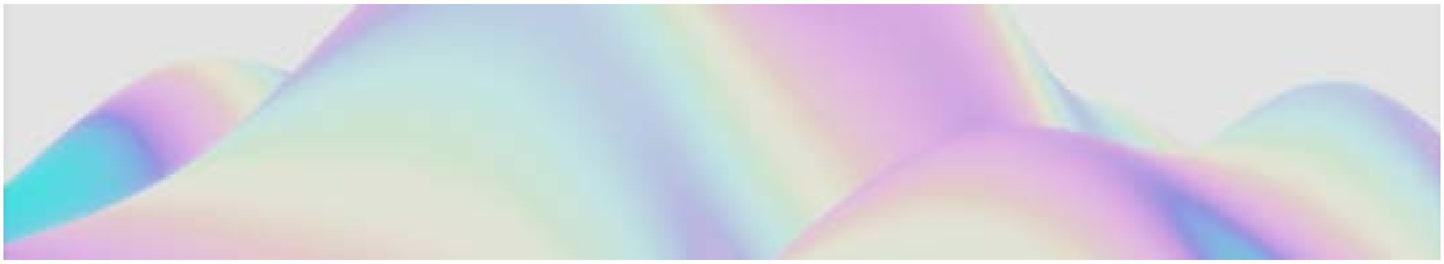
Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	We focused on developing our process and product video to present a comprehensive overview of how our team approached and executed the project. The primary aim was to outline the complete workflow, highlighting key steps in project development and showcasing the final product's usability tailored to the specific use cases identified. We worked collaboratively, assigning roles to ensure a balanced distribution of tasks—some members contributed through research and data structuring, while others focused on scripting and video editing. This deliverable allowed us to encapsulate our design considerations, such as normalization to maintain data integrity, strategic denormalization for performance optimization, and the role of weak entities in preserving nuanced relationships within the database structure.
21:00		@LE TRUONG THIEN NGUYEN	The content of the video, serving as a summary of our report, was strategically crafted to demonstrate not only the technical aspects but also the practical

		@MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	application of our solution. Our content included a clear introduction and mission statement, details on team processes and collaboration, and an explanation of our logical and physical design decisions. Additionally, we discussed how these decisions supported specific use cases, showcasing examples such as SQL queries that leveraged the data structure effectively. By adhering to the Unit Learning Outcomes, we ensured that our final product reflected ethical and professional standards, emphasized clear communication, and demonstrated our technical literacy and teamwork. This comprehensive approach reinforced our ability to contribute responsibly and effectively as team members.

✅ Action items

- Work on Process and Product Video (Week 12)

Decisions



09/11/2024 Meeting notes

📅 Date

Nov 9, 2024

👥 Participants

- @LE TRUONG THIEN NGUYEN
- @MINH PHUONG ANH MAI
- @CONG HUNG PHAN
- @NGUYEN DANG DUY LE
- @MINH DUY NGUYEN

🥅 Goals

- Each member complete their own 4Ls Retrospective

Time	Item	Presenter	Notes
20:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @CONG HUNG PHAN @MINH DUY NGUYEN	Each member completes their 4Ls Retrospective
21:00		@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE	Meeting ended.

		@CONG HUNG PHAN @MINH DUY NGUYEN	

Action items

- [x] Each member completes their 4Ls Retrospective

Decisions

Team agreement

Team Preferences

Team Member	@LE TRUONG THIEN NGUYEN	@MINH DUY NGUYEN	@CONG HUNG PHAN	@NGUYEN DANG DUY LE	@MINH PHUONG ANH MAI
Working location and timezone	Ho Chi Minh City, UTC+7	Ho Chi Minh City, UTC+7	Ho Chi Minh City, UTC+7	Ho Chi Minh City, UTC+7	Ho Chi Minh City, UTC+7
Working hours and commitments	7 A.M. - 7.P.M Overtime if necessary.	7 A.M. - 9 P.M, childcare responsibilities after 9 P.M. ❤️	12 P.M - 12 A.M, go to sleep after 12.30 A.M	7A.M - 12A.M	8 A.M - 5P.M
Working environment and preferences	I prefer working in an office environment for clear communication and collaboration,	I prefer working in cafes, on campus, or at home, depending on the task.	I can work from my lovely bedroom, but if there is a chance I would love to work directly face to face.	I usually work from my office, but I can work remotely if necessary.	I prefer working remotely. Though, I can go to the office if needed.
How I like receiving feedback	Through messages, emails, or regular check-ins to address issues as they arise.	Direct, immediate, and clear feedback to make quick improvements.	Feel free to DM me for feedback.	Directly in a moment. Kindly refrain from reaching out after 9 P.M.	Directly texts, before 5P.M. Urgent cases through emails.
Context about me	Outside of work, I love movies and games, and I enjoy listening to music occasionally.	I am a professional Valorant player. Also as coder and teacher.	I am addicted to music especially Carpetman's music. Try them, those	I am a hard-working person.	As an introvert, I need much time to reflect and keep on improving myself.

			songs hit hard !!!		

💬 Communication Channels

Channel	Purpose	Objects	Standards
Zalo	Quick, real-time communication for urgent updates, informal discussions, and daily check-ins.	Project team	• Used for immediate responses and real-time collaboration. • Should be kept professional and brief, with follow-ups on other channels for more complex issues. • Response time: Within 1 hour during work hours.
Gmail	Formal communication, sharing important documents, project updates, and external communications with clients.	Project Manager, Project Team, Clients	• Emails should be clear, detailed, and professional. • Used for official correspondence, deliverables, and formal approvals. • Response time: Within 6 hours.
Confluence	Documentation, knowledge sharing, project tracking, and storing key project resources	Project Team	• All project documentation should be kept up-to-date and organized. • Used for meeting minutes, project reports, and knowledge-sharing. • Regular updates to be made after each milestone or significant change.
Microsoft Teams	Virtual meetings, in-depth discussions, and collaborative planning.	Project Team	• Meetings should have clear agendas and action items. • Used for presentations and team collaboration. • Record and share meeting minutes on Confluence post-meeting.

📅 Meetings

Objective	**Daily Scrum**	**Sprint Planning**	**Sprint Retrospective**
Outcomes	Immediate identification of blockers, daily progress updates, minor adjustments to keep the team aligned.	A clear understanding of sprint goals, task assignments, and team alignment on responsibilities.	Identification of what went well, areas for improvement, and actionable changes for future sprints.
Format	15-minute stand-up meeting (Microsoft Teams or in-person).	1-2 hour meeting (Microsoft Teams or in-person).	1-hour meeting (Microsoft Teams or in-person).

Who	Project Team	Project Team	Project Team
Resources	Zalo for quick communication, task board or sprint board for status updates.	Sprint backlog, project management tool, Confluence for documentation.	Retrospective board or document in Confluence, feedback from the sprint.
How will we show up?	Be prepared with a quick update on progress, any blockers, and planned work for the day.	Prepared with knowledge of the previous sprint's outcomes, priorities for the next sprint, and a clear plan for each task.	Ready to share successes, challenges, and ideas for constructively improving processes.
How will we manage follow-up?	Action items and blockers are recorded on Zalo or a task management tool (e.g., JIRA or Trello), with further details documented in Confluence if necessary.	Sprint goals and task distribution are documented in Confluence, with action items tracked in the project management tool—identification of what went well, areas for improvement, and actionable changes for future sprints.	Actionable changes documented in Confluence, and process improvements tracked in the project management tool or task board.

Escalation Process

Decider	How	Transparency	Feedback Loop
Project Manager	Through Microsoft Teams meetings or Gmail for formal communications.	Ensures transparency by documenting issues and decisions in Confluence and communicating with the team.	Feedback from the team is discussed in project syncs or daily Scrum, with resolutions documented in Confluence.
Software Engineer	Uses Zalo for quick communication or logs issues in the task management tool.	Issues are logged and visible to the Project Team via task management tools, ensuring full visibility.	Project Manager and team collaborate on solutions, with updates shared in daily Scrum or project syncs.
AI Specialist	Zalo for quick discussions or during Sprint Planning meetings in Microsoft Teams.	AI-related issues are logged in the task management tool and reviewed by relevant team members.	Feedback is given during Sprint Review or daily stand-ups, and actions are tracked in Confluence or the project management tool.
UI/UX Designer	Escalates through Zalo for immediate attention or in weekly project syncs via Microsoft Teams.	Design-related issues are recorded in the task management tool and	Feedback is gathered from the Software Engineer and adjustments made to

		reviewed with the development team.	the design, with updates tracked in Confluence.
Data Engineer	Uses Zalo for immediate communication and Microsoft Teams for detailed issue discussions.	Data-related issues are tracked in the task management tool and shared with the relevant teams.	Feedback and resolutions are communicated back in project syncs, with data adjustments recorded in Confluence.

💡 Continuous Improvement

Purpose	How	Standards
Enhance Team Efficiency	Conduct regular Sprint Retrospectives to review what went well and identify areas for improvement.	All feedback must be actionable and focused on improving specific processes or workflows.
Optimize Workflow and Processes	Implement small, incremental changes after each sprint to address inefficiencies.	Process improvements should be documented in Confluence and reviewed regularly to measure effectiveness.
Increase Product Quality	Regularly test features, gather user feedback, and apply learnings in future sprints.	Ensure that all improvements are based on data, feedbacks, and measurable outcomes to enhance product quality.
Promote Team Collaboration	Encourage open communication and knowledge sharing within the team through regular syncs.	Team members should actively contribute ideas during retrospectives and feedback sessions.
Foster Innovation	Allow team members time to experiment with new tools or methods during sprints.	Experimentation should be aligned with the project’s goals, and outcomes should be evaluated objectively.

Performance improvement plan

📪 Sample email

From:

To:

CC:

Date:

Subject: Performance Improvement Plan

Dear ,

The purpose of this letter is to clarify expectations regarding your role, document performance issues that are preventing you from meeting those expectations, and give you the opportunity to address those issues and raise your performance to a satisfactory level.

Starting on , you are being placed on a performance improvement plan to address the issues outlined below. Over the next days, you must constructively address these concerns and meet all expectations for performance. If you don't make adequate progress or we identify additional problems, we may terminate your employment at .

Review the information outlined below and ask me if you have any questions. I will meet with you regularly to review your progress, offer guidance, and provide feedback on your performance. For your next meeting, please prepare an action plan explaining how you plan to meet the expectations outlined below and what steps you will take during this period to improve your performance.

If you have questions about your performance improvement plan, please feel free to contact me or your HR Business Partner, , at .

🔆 Performance improvement plan for

Expectation	Deficit	Examples
🔅 **Objective:**		
Expectation	**Deficit**	**Examples**

		• • •
☼ **Objective:**		
Expectation	**Deficit**	**Examples**
		• • •
☼ **Objective:**		

Manager Signature	
Employee signature	
Date	

Team Health Monitor

Team name	**Elysium**
Sponsor	**Elysium**
Health monitor cadence	**Elysium**

Team health assessment

With your team, read the definition of each attribute of healthy, high-performing teams out loud. On the count of three have each person rate how they feel the team is doing compared to each definition (thumbs-up/green, thumbs-sideways/yellow, thumbs-down/red). Record the results of each attribute rating in the table. Highlight each cell using this color code:

HEALTHY = "We're strong here"

BIT SICK = "We're ok... but a little shaky"

SICK = "We're not healthy"

Area	Truong Thien	Phuong Anh	Cong Hung	Minh Duy	Dang Duy

🚩 **Full-time owner** There is **one lead who is accountable** for the result of this project. This needs to be someone whose time is at least 80% dedicated to it, and who can champion the mission inside and outside of the team.	As the leader, I see my role as more than just overseeing tasks—I'm here to drive the project forward and inspire the team. I'm fully committed to ensuring we stay on course, making sure every detail aligns with our bigger picture. I believe in leading with purpose, ensuring that everyone feels supported and that we're delivering results that matter.	He is the leader who brings clarity and focus to the project. He's always present, not just as a guide but as someone who lifts the team. His direction keeps us aligned and his ability to manage both strategy and details keeps us motivated.	Thien's commitment to the project is impressive. He's deeply involved, dedicating most of his time to ensuring we stay on course. His calm, clear leadership makes even the toughest challenges easier to handle.	Our leader drives our success. He invests 90% of his time ensuring every detail is managed, pushing us to deliver our best work. His focus and commitment are key to our progress	He is our role model, dedicating 90% of his time to the project. His commitment and ability to motivate the team keep us on track and focused on meeting our goals.
⚖️ **Balanced team** **Roles and responsibilities are clear** and agreed upon. The project has people with the right blend of skill set. Acknowledge that team members can change by stage.	As a team, we have a clear understanding of each member's role. This clarity ensures that tasks are distributed efficiently, allowing everyone to contribute equally towards our objectives. The balance of responsibilities helps foster accountability and shared ownership, making us stronger as a team.	Our team has clear roles and responsibilities, making sure everyone is aligned and contributes effectively. Each task is assigned based on individual strengths, ensuring everyone plays to their abilities. This results in a cohesive environment where we all feel empowered to give our best.	We operate with a strong sense of clarity when it comes to roles within the team. Each person knows exactly what is expected of them, which leads to a well-balanced workflow. By maximizing individual strengths, we're able to work more efficiently and with greater focus on our shared goals.	The way we've structured our roles brings out the best in each of us. Everyone knows what they're responsible for, and that clarity makes our workflow more efficient. With clear roles, we can focus our efforts on working together to achieve our objectives.	Our team thrives because roles and responsibilities are clearly defined. Each person is assigned tasks that align with their strengths, which helps us function smoothly. This balance ensures that everyone is giving their best and feels valued for their contributions.
💞 **Shared understanding** The team has a **common understanding of why they're here**, the problem/need, are convinced about the idea, confident they have what they need, and trust each other.	Our team's preparation and dedication in every meeting are what make us stand out. We come ready with all the information we need to make decisions, and it allows us to move forward together confidently	I'm proud of how aligned our team is when it comes to understanding the problem we're solving. We all share the same belief in our mission, and this gives me confidence that we're headed in the right direction.	We regularly hold meetings to make sure everyone understands their responsibilities clearly. Any questions or uncertainties are addressed right away, which keeps things running smoothly and	Our meetings are highly productive. We take the time to clarify tasks and make sure everyone is on the same page. This helps eliminate misunderstandings and ensures that we're all working toward the same goals.	I've never worked with a team that has such a strong sense of trust. I know that everyone is fully committed and has the skills to deliver great results. It's reassuring to know I can depend on my teammates.

			leaves no room for confusion.		
Value and metrics It's clear **what success means** from a business and user's perspective, and there is a unique value proposition in place for the target users and to the business. Success is defined, with a goal, and how it will be measured.	Our goals are ambitious. To hit the target, we need precise tracking and monitoring of greenhouse conditions. These metrics will serve as a compass, steering the IoT-enabled system towards peak performance and the successful optimization of crop growth. Investing in real-time data monitoring will be key to our success.	Our project goals are clear, but we can enhance our success by refining how we track our metrics. This will give us a concrete measure of progress and allow us to adjust in real time to ensure the best outcomes.	We've set clear objectives for the smart greenhouse, but to ensure the system runs as efficiently as possible, we need to improve how we track and monitor key performance indicators. Metrics such as energy usage and crop yield should be continuously assessed to guarantee that we meet our goals	I appreciate the team's commitment to defining measurable goals. However, we can improve by investing in a robust system for monitoring metrics like real-time environmental data. This would help us better align our actions with project goals and ensure the greenhouse operates at peak efficiency.	Our objectives are clear, but to meet them efficiently, we need to step up our monitoring. A robust tracking system will guide us toward the successful completion of the project.
Proof of concept Some sort of demonstration has been created and tested, that demonstrates why this problem needs to be solved, and demonstrates its value.	Our proof of concept represents the heart of our project. It showcases the real-world potential of the IoT-controlled system we're building. By demonstrating how real-time data can optimize growing conditions, we're not just solving a problem—we're proving the immense value this system can bring to agriculture. This success is a true reflection of the team's hard work and dedication.	Our team's approach to collaboration has been key to our success. Regular discussions and presentations allow us to refine our ideas, and everyone gets a chance to contribute, ensuring the proof of concept is both well-rounded and impactful.	We regularly meet to dive deep into discussions and presentations. This allows everyone to share insights and ideas. Consistent updates and demos of the system have helped us fine-tune our IoT-controlled greenhouse, making our proof of concept even stronger.	Our proof of concept is a major success. It not only highlights the urgency of improving crop growth conditions but also showcases the immense value of using IoT technology to optimize greenhouse environments. This demo solidifies the importance of our project.	The demonstration we've built is truly a game-changer. It clearly illustrates the necessity of solving this problem and emphasizes the significance of leveraging real-time data and AI to adjust growing conditions. It's proof of the value our project brings.
One-pager The **project is summarized** in a one-pager and shared with anyone so that they understand the purpose of the project, and its value.	You can locate a one-page document on the Confluence page specific to our project.	A one-page summary of our project is available on the Confluence page.	You'll discover a one-pager on the Confluence page that focuses on our project.	There's a one-page document on the Confluence page related to our project.	Check the Confluence page for a one-pager regarding our project.

🧍 **Managed dependencies** Clear understanding of complexity, infrastructure involved, risks, resources, effort, and timeline. Clear understanding of **who we depend on, and who depends on us.**	Managing dependencies has been crucial to the success of our greenhouse project. We consistently assess risks, allocate resources efficiently, and establish clear timelines. This understanding of the project's intricacies ensures that we stay on track and meet our goals.	Our team is highly skilled at proactively managing complexities and dependencies. We have a solid grasp of the infrastructure, risks, resources, and timeline involved in our IoT-controlled greenhouse project, ensuring that we're always prepared to address challenges.	Although we've faced challenges in mapping out dependencies, particularly in the integration of our IoT systems, our team's ability to navigate these complexities ensures we can effectively manage risks, allocate resources, and keep the project on track.	We maintain a sharp focus on dependencies and project intricacies. By carefully assessing risks and allocating resources where they're needed most, we've established a realistic timeline to ensure smooth progress.	Our team excels at handling the dependencies within this project. We have a thorough understanding of the complexity involved, and we're adept at managing infrastructure, resources, and timelines to ensure the project's success.
🏇 **Velocity** The team is making **incremental progress** by shipping concrete iterations to stakeholders (and, even better, to production), learning along the way, and **implementing lessons learned**, resulting in greater success.	Our project's steady progress is a testament to the team's dedication. Regular updates and feedback are more than just check-ins—they're opportunities to enhance and refine our IoT system for the greenhouse. This process of learning and adjusting keeps us moving toward success.	For me, maintaining steady momentum is key to our success. Keeping regular updates and feedback loops with our stakeholders is crucial. This ensures we continually refine and enhance our IoT-controlled greenhouse project.	We're keeping up steady progress by consistently sharing updates with stakeholders. This ongoing communication has provided invaluable feedback, helping us make necessary adjustments and improve our project as we go.	Our continuous momentum has been critical. Regular feedback has helped us identify improvements quickly, allowing us to implement changes that push our project forward.	Sustaining a steady pace has been essential for our project. Regular feedback from stakeholders ensures that we stay on track and are able to make timely refinements to improve our system.

🎯 Focus areas

Each team member concentrates on these key focus areas. After defining the attributes, the team works together to brainstorm actionable steps that help transform areas in need of improvement into high-performing ones.

Member	Focus areas and action items
Dang Duy	**Creative Innovation:** *Attribute:* Team members think outside the box and contribute novel ideas to improve processes or solve problems. *Actionable Actions:* • Organize innovation workshops or hackathons to inspire creative thinking. • Recognize and reward innovative solutions or suggestions brought by team members.
Phuong Anh	**Emotional Intelligence:** *Attribute:* Team members are aware of their own emotions and those of others, facilitating better communication and relationships. *Actionable Actions:*

	• Provide training on emotional intelligence to help team members understand and manage emotions effectively. • Encourage empathetic listening and open dialogue to build stronger connections within the team.
Cong Hung	**Time Management:** *Attribute:* Team members manage their time effectively, prioritizing tasks to meet deadlines and deliver quality work. *Actionable Actions:* • Implement time-tracking tools to help team members monitor and improve their productivity. • Offer training on prioritization techniques, such as the Eisenhower Matrix or Pomodoro technique, to enhance focus.
Minh Duy	**Risk Management:** *Attribute:* The team anticipates and identifies potential risks, mitigating them before they become larger issues. *Actionable Actions:* • Conduct regular risk assessments and identify potential challenges for ongoing projects. • Assign risk owners to track and manage specific risks, ensuring they are addressed promptly.
Truong Thien	**Continuous Learning and Development:** *Attribute:* Team members are committed to personal and professional growth, seeking opportunities to improve their skills. *Actionable Actions:* • Provide access to training resources, such as online courses or workshops, to enhance team skills. • Encourage team members to set individual learning goals and share their new knowledge with the group.

Trello Board

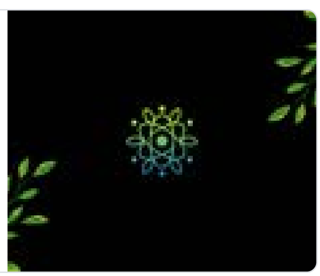
Team Health Monitor [16-10-2024]
elysiumnexus

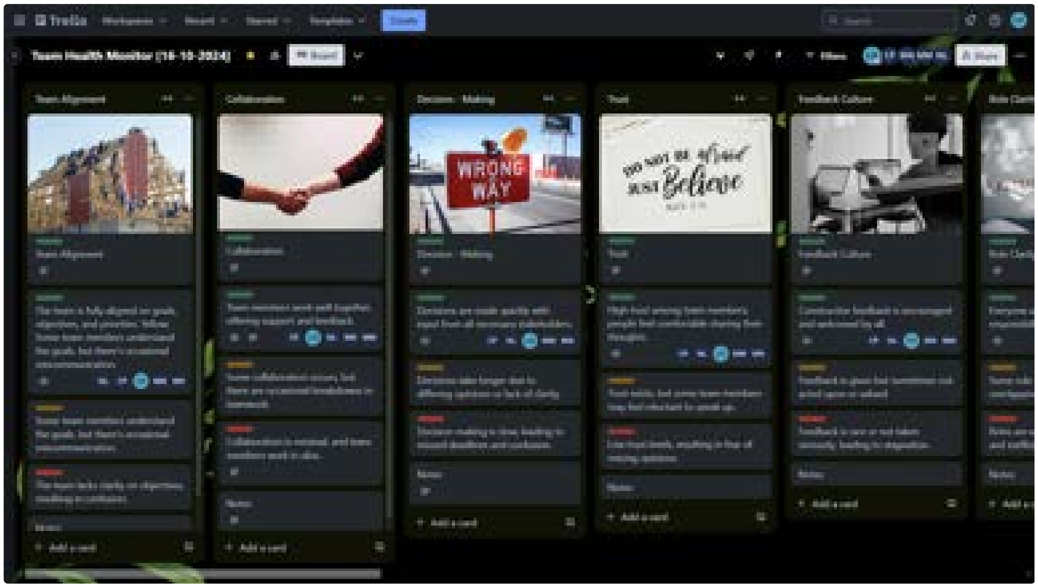
CP LN MN +2

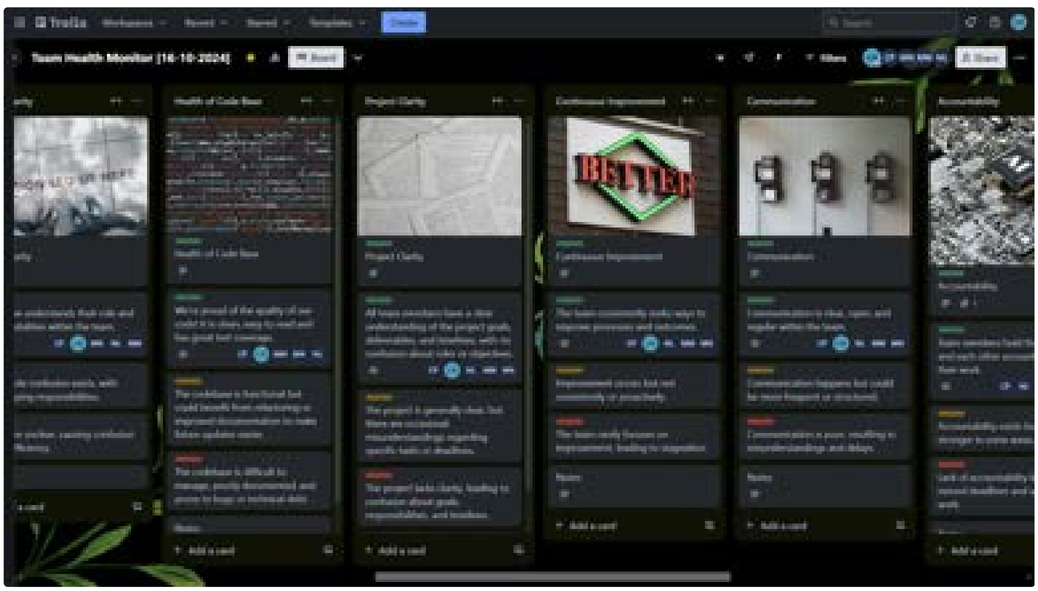
The Health Monitor is your team's chance to take an honest look in the mirror. You'll assess your team against the eight attributes most commonly found among healthy teams. At the end of each Health Monitor session, you'll identify strengths to exploit as well as challenge areas …

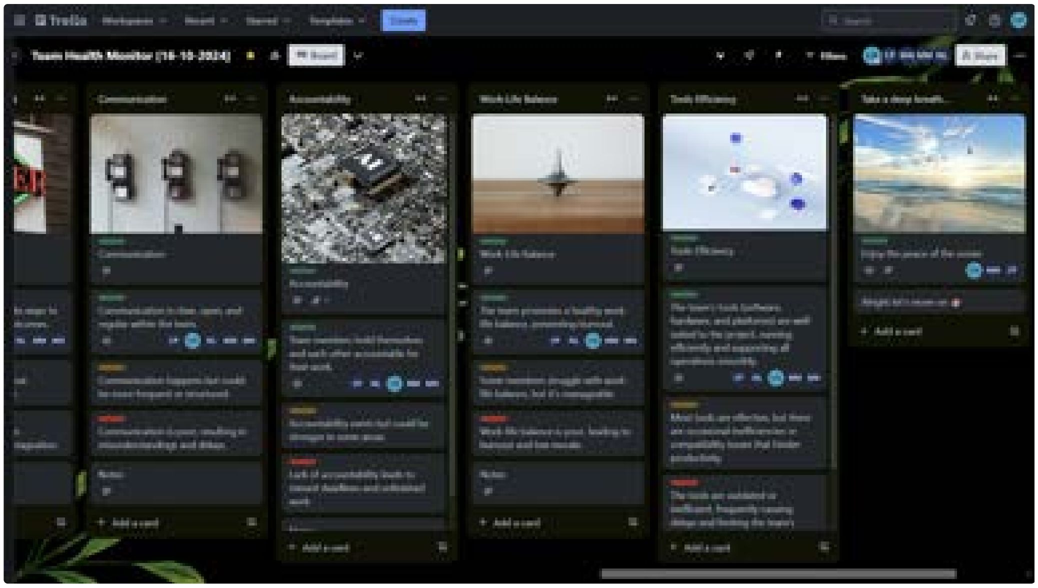
Trello

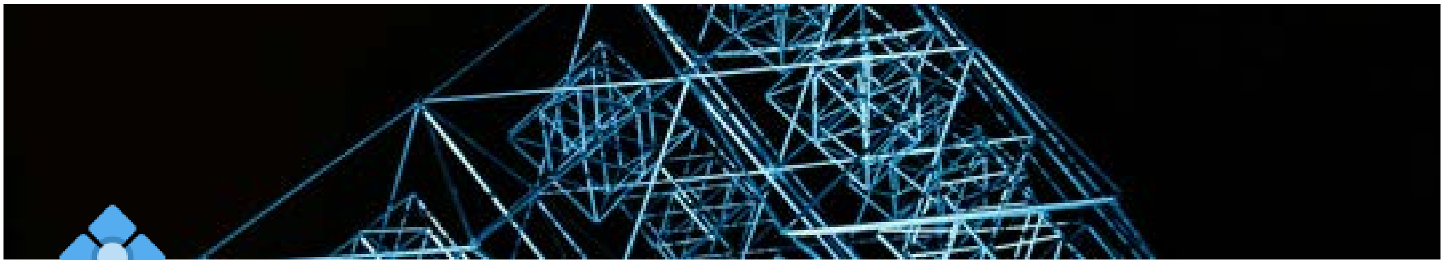
Open preview




Trello
Team Health Monitor [16-10-2024]
WRONG WAY


Trello
Team Health Monitor [16-10-2024]
BETTER


Trello
Team Health Monitor



Entity Relationship Diagram (ERD)

Overview

The Elysium project's Entity-Relationship Diagram (ERD) is a comprehensive representation of the data architecture that supports the Smart Greenhouse system. It highlights the main entities, their attributes, and the relationships between them, structured into key sections: **Technical Development and Support**, **Data Management and Analysis**, **Core Infrastructure**, **Supply and Manufacturing**, **Monitoring and Control**, and **Maintenance and Operation**. Each section is designed to ensure seamless data flow, maintain system integrity, and enable effective management and optimization of greenhouse operations. This ERD serves as a foundational blueprint for the logical and physical database designs, facilitating a scalable, secure, and efficient system to enhance agricultural productivity.

1. Greenhouse

- **Attributes**:
  - **Greenhouse_ID** (Primary Key)
  - **Location** (Geographical location of the greenhouse)
  - **Size** (Physical size of the greenhouse)
  - **Crop_Type** (The type of crops grown)
  - **Status** (Active, Inactive)
  - **Owner_ID** (Foreign Key referencing the User managing the greenhouse)
- **Purpose**: Represents the physical greenhouse, monitored and controlled using IoT sensors, AI models, and actuators.

---

2. IoT Sensor

- **Attributes**:
  - **Sensor_ID** (Primary Key)
  - **Sensor_Type** (e.g., Temperature, Humidity, CO2, Soil Moisture)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse)
  - **Installation_Date** (Date when the sensor was installed)
  - **Sensor_Status** (Active, Faulty, Offline)
- **Purpose**: Monitors environmental conditions in the greenhouse and generates data for climate control and optimization.

---

3. Data

- **Attributes**:
  - **Data_ID** (Primary Key)
  - **Sensor_ID** (Foreign Key referencing the IoT Sensor)

- **Timestamp** (When the data was collected)
- **Value** (Numeric value depending on the sensor type, e.g., temperature in °C)
- **Data_Type** (e.g., Temperature, Humidity)
- **Purpose**: Stores data generated by IoT sensors for analysis and decision-making by AI models.

---

4. AI Model

- **Attributes**:
  - **Model_ID** (Primary Key)
  - **Model_Type** (e.g., Temperature Optimization, Humidity Control)
  - **Version** (Version of the AI model)
  - **Last_Training_Date** (Date when the AI model was last trained)
  - **Accuracy** (Model's performance accuracy in percentage)
- **Purpose**: AI models analyze data and provide insights or control commands to optimize greenhouse conditions.

---

5. Control System

- **Attributes**:
  - **Control_ID** (Primary Key)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse)
  - **Control_Type** (e.g., Temperature, Humidity, Lighting, Irrigation)
  - **Status** (Active, Inactive)
- **Purpose**: Manages the greenhouse climate by receiving data from AI models and controlling actuators.

---

6. User

- **Attributes**:
  - **User_ID** (Primary Key)
  - **Name** (Full name of the user)
  - **Role** (Admin, Farmer, Technician)
  - **Email** (Contact email)
  - **Password** (Encrypted password for authentication)
  - **Phone** (Contact phone number)
  - **Address** (Physical address of the user)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse(s) managed)
- **Purpose**: Represents actors in the system (Farmers, Engineers, Technicians, Administrators) with specific roles and permissions.

---

7. Mobile Application

- **Attributes**:
  - **App_ID** (Primary Key)
  - **Version** (Version of the mobile app)
  - **Last_Update** (Date of the last update)
  - **User_ID** (Foreign Key referencing the User)

- **Purpose**: Allows users to monitor and control greenhouse systems via mobile devices.

---

8. Alert

- **Attributes**:
  - **Alert_ID** (Primary Key)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse)
  - **Alert_Type** (e.g., Temperature Too High, Humidity Too Low)
  - **Generated_Date** (Date the alert was created)
  - **Status** (Pending, Resolved)
- **Purpose**: Notifies users of critical conditions in the greenhouse that require immediate attention.

---

9. Actuator

- **Attributes**:
  - **Actuator_ID** (Primary Key)
  - **Actuator_Type** (e.g., Fan, Sprinkler, Light, Heater)
  - **Status** (Active, Inactive)
  - **Control_ID** (Foreign Key referencing the Control System)
- **Purpose**: Physically alters greenhouse climate conditions by executing commands from the control system.

---

10. Climate Condition

- **Attributes**:
  - **Condition_ID** (Primary Key)
  - **Condition_Type** (e.g., Temperature, Humidity, Lighting, CO2)
  - **Optimal_Range_Min** (Minimum value for optimal condition)
  - **Optimal_Range_Max** (Maximum value for optimal condition)
  - **Current_Value** (Current value being measured)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse)
- **Purpose**: Monitors climate parameters and ensures they are within optimal range for crop health and growth.

---

11. Maintenance Record

- **Attributes**:
  - **Maintenance_ID** (Primary Key)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse)
  - **User_ID** (Foreign Key referencing the User)
  - **Date_Performed** (Date maintenance was performed)
  - **Task_Description** (Details of the maintenance task)
  - **Sensor_ID** (Foreign Key referencing IoT Sensor, if related)
- **Purpose**: Logs maintenance activities to track performance and ensure smooth operations.

---

12. Technology Provider

- **Attributes**:
  - **Provider_ID** (Primary Key)
  - **Provider_Name** (Name of the technology provider)
  - **Technology_Type** (Category of technology provided, e.g., IoT Sensors, AI Solutions)
  - **Location** (Geographical location of the provider)
  - **Contact_Info** (Phone number, email)
  - **Partnership_Date** (Date when the partnership started)
  - **Service_Level** (Level of service or support offered)
- **Purpose**: Represents external companies providing technology solutions for monitoring, automation, and farming.

---

13. Greenhouse Operator

- **Attributes**:
  - **Operator_ID** (Primary Key)
  - **Name** (Name of the operator)
  - **Greenhouse_Location** (Physical location of the greenhouse)
  - **Greenhouse_Size** (Size of the greenhouse)
  - **Crop_Type** (Types of crops grown)
  - **Technology_Used** (Types of technology implemented)
  - **Operation_Start_Date** (Start date of operations)
- **Purpose**: Manages daily operations and ensures that growing conditions are optimized.

---

14. Crop Farmer

- **Attributes**:
  - **Farmer_ID** (Primary Key)
  - **Farmer_Name** (Name of the farmer)
  - **Farm_Location** (Location of the farm)
  - **Farm_Size** (Size of the farm in hectares or acres)
  - **Crop_Varieties** (Types of crops being grown)
  - **Farming_Methods** (Methods used, e.g., Organic, Hydroponic)
  - **Technology_Adoption** (Technology used in farming)
- **Purpose**: Represents farmers responsible for growing crops, often utilizing advanced technology.

---

15. Software Engineer

- **Attributes**:
  - **Engineer_ID** (Primary Key)
  - **Engineer_Name** (Name of the engineer)
  - **Specialization** (Backend, Frontend, Full-stack)
  - **Programming_Skills** (Languages or frameworks known)
  - **Projects_Handled** (List of ongoing/past projects)
  - **Employment_Start_Date** (Date of joining the project)

- **Purpose**: Develops and maintains software infrastructure for greenhouse monitoring systems.

---

16. Environmental Researcher

- **Attributes**:
  - **Researcher_ID** (Primary Key)
  - **Researcher_Name** (Name of the researcher)
  - **Field_of_Expertise** (e.g., Climate Science, Sustainable Agriculture)
  - **Institution_Affiliation** (Affiliated institution or university)
  - **Publications** (List of research papers)
  - **Active_Projects** (Ongoing research projects)
  - **Start_Date** (Start date of research involvement)
- **Purpose**: Studies environmental factors to improve farming techniques and sustainability.

---

17. AI Developer

- **Attributes**:
  - **Developer_ID** (Primary Key)
  - **Developer_Name** (Name of the AI developer)
  - **Specialization** (Machine Learning, Neural Networks)
  - **Tools_Used** (e.g., TensorFlow, PyTorch)
  - **Projects_Developed** (List of AI projects)
  - **Start_Date** (Start date of AI development)
- **Purpose**: Designs and implements AI models for greenhouse and farming automation.

---

18. Sensor Manufacturer

- **Attributes**:
  - **Manufacturer_ID** (Primary Key)
  - **Manufacturer_Name** (Name of the sensor manufacturer)
  - **Sensor_Type** (Types of sensors produced, e.g., Temperature, Humidity)
  - **Product_Line** (List of products offered)
  - **Location** (Geographic location of manufacturing facilities)
  - **Distribution_Network** (Details about global or regional distribution)
  - **Start_Date** (Date when the manufacturer started supplying sensors)
- **Purpose**: Designs and supplies sensors for monitoring environmental factors like soil moisture, temperature, and humidity in greenhouse systems.

---

19. Data Analyst

- **Attributes**:
  - **Analyst_ID** (Primary Key)
  - **Analyst_Name** (Name of the data analyst)
  - **Skills** (e.g., Python, SQL, R, Excel)

- **Tools_Used** (Software used for data analysis, e.g., Power BI, Tableau)
- **Projects_Analyzed** (List of projects where analysis was conducted)
- **Start_Date** (Date the analyst began working on data for the project)

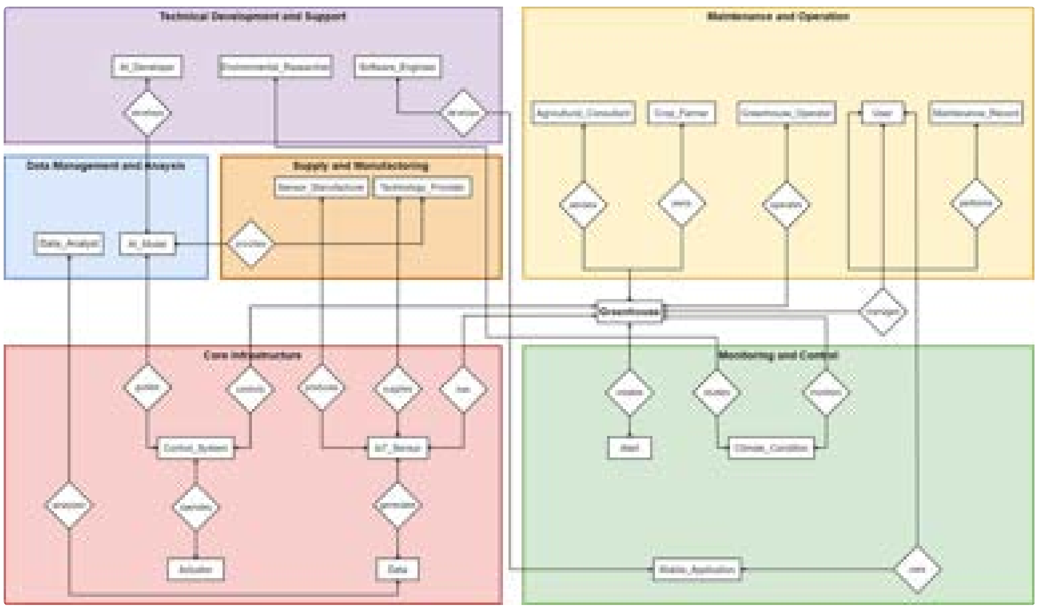
- **Purpose**: Interprets and analyzes sensor data to provide actionable insights for optimizing greenhouse operations and improving crop yields.

---

20. Agricultural Consultant

- **Attributes**:
  - **Consultant_ID** (Primary Key)
  - **Name** (Name of the agricultural consultant)
  - **Email** (Contact email)
  - **Phone** (Contact phone number)
  - **Specialization** (e.g., Crop Selection, Soil Management)
  - **Greenhouse_ID** (Foreign Key referencing the Greenhouse(s) they consult for)
  - **Consultation_Date** (Date of consultation or start of consultancy)
- **Purpose**: Provides expert advice on agricultural practices such as crop selection, soil management, and technology integration to optimize greenhouse performance.

Conceptual Design



Introduction

The conceptual design of the Elysium project's Entity-Relationship Diagram (ERD) serves as the foundation for understanding the key entities and relationships involved in our Smart Greenhouse System. This design provides an overarching view of how data flows through different components of the project, aligning with the project's goal to create an IoT-enabled, AI-driven solution for optimizing greenhouse operations.

Overview

The conceptual ERD illustrates the major functional areas of the project, including **Technical Development and Support**, **Data Management and Analysis**, **Core Infrastructure**, **Supply and Manufacturing**, **Monitoring and Control**, and **Maintenance and Operation**. Each section is interconnected, highlighting the collaborative relationships between roles, data entities, and system components necessary for seamless operation and management of the greenhouse.

The ERD design is strategically divided to reflect the interaction between various roles such as **AI Developers**, **Software Engineers**, **Data Analysts**, and **Greenhouse Operators**, as well as essential system components including **IoT Sensors**, **Control Systems**, and **Climate Conditions**. This design approach ensures that data is properly managed, analyzed, and applied to optimize greenhouse functionality.

Detailed Description of the ERD

1. Technical Development and Support

- **Roles**: Includes AI Developers, Environmental Researchers, and Software Engineers.
- **Key Relationships**:
  - The **AI Developer** and **Software Engineer** develop critical components for the **AI Model** and **Control System**, respectively.
  - Collaboration between developers and researchers supports comprehensive system design and ensures that technology development aligns with environmental data needs.

2. Data Management and Analysis

- **Entities**: **Data Analyst**, **AI Model**.
- **Key Relationships**:
  - **Data Analysts** provide insights by managing and analyzing data that feeds into the **AI Model** for decision-making.
  - The **AI Model** utilizes analyzed data to guide greenhouse operations and optimize conditions.

3. Core Infrastructure

- **Entities**: **Control System**, **IoT Sensor**, **Actuator**, **Data**.
- **Key Relationships**:
  - The **Control System** interacts with **IoT Sensors** to collect data and controls **Actuators** to adjust conditions as needed.
  - **IoT Sensors** generate real-time data that is analyzed and used by the system to ensure the greenhouse operates efficiently.

4. Supply and Manufacturing

- **Entities**: **Sensor Manufacturer**, **Technology Provider**.
- **Key Relationships**:
  - These entities supply the **IoT Sensors** and **Control System**, ensuring that the technological infrastructure is up-to-date and functional.
  - The **Supply and Manufacturing** section ensures that all equipment meets the required standards for optimal performance.

5. Monitoring and Control

- **Entities**: **Alert**, **Climate Condition**, **Mobile Application**.
- **Key Relationships**:
  - The **Mobile Application** monitors and controls the **Climate Conditions** within the greenhouse, using data to create alerts and facilitate user interaction.
  - **Climate Conditions** are studied and monitored, and alerts are created when conditions fall outside desired thresholds, ensuring proactive management.

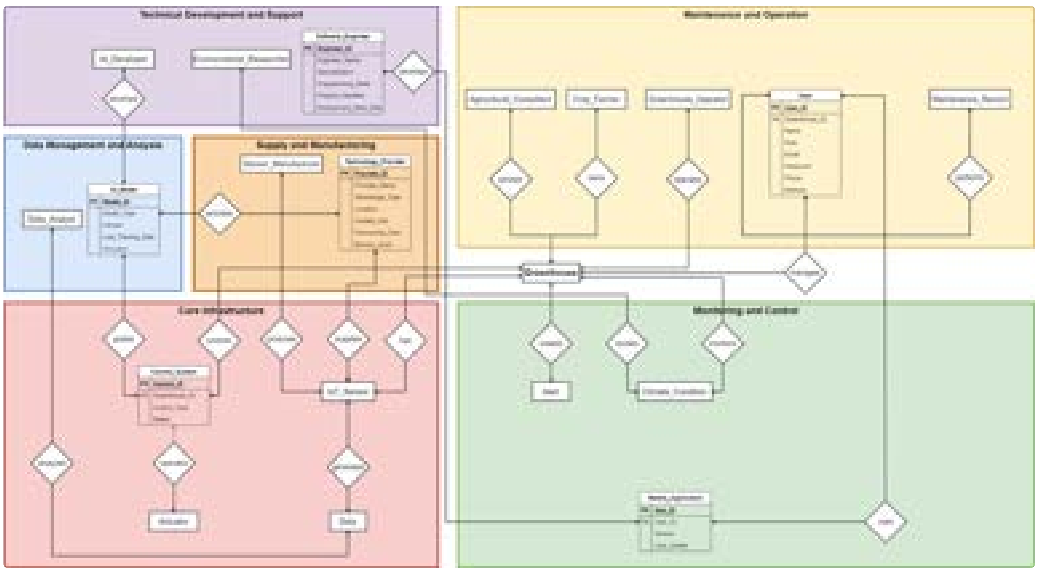
6. Maintenance and Operation

- **Roles**: **Agricultural Consultant**, **Crop Farmer**, **Greenhouse Operator**, **User**.
- **Key Relationships**:
  - **Crop Farmers** own the greenhouse and are advised by **Agricultural Consultants** to maintain optimal crop conditions.
  - **Greenhouse Operators** manage day-to-day operations, supported by system-generated **Maintenance Records** to ensure equipment functions properly.

Conclusion

This conceptual ERD is designed to capture the relationships between various components and roles that are vital to the success of the Elysium Smart Greenhouse project. It sets the groundwork for further development into logical and physical data models, ensuring that all essential elements are incorporated effectively into subsequent stages.

🧠Logical Design



Introduction

The logical design of the Elysium project's Entity-Relationship Diagram (ERD) builds upon the conceptual model, detailing the structure of the system in a more precise format. This level of design represents entities, their attributes, and the relationships between them, ensuring a clear understanding of how data interacts within the Smart Greenhouse system. It serves as a foundation for the upcoming physical database design and guides the data structure implementation.

Overview

The logical ERD for the Elysium project provides a more detailed view of the data schema, showcasing the primary keys (PK), foreign keys (FK), and specific attributes for each entity. It ensures that relationships are accurately depicted, supporting data integrity and enabling efficient data processing within the system. The design encompasses the main components necessary for technical development, data management, monitoring, maintenance, and system operations.

Detailed Description of the Logical ERD

1. Technical Development and Support

- **Entities**:
  - **AI Developer**: Works on the development of the **AI Model**.

- **Software Engineer**: Contains detailed attributes such as `Engineer_ID`, `Name`, `Specialization`, `Programming_Skills`, `Projects_Handled`, and `Employment_Start_Date`.
- **Environmental Researcher**: Collaborates to enhance environmental data usage.

- **Key Relationships**:
  - The **AI Developer** and **Software Engineer** are integral in developing the **AI Model** and related software for the greenhouse's operation.

2. Data Management and Analysis

- **Entities**:
  - **AI Model**: Attributes include `Model_ID`, `Model_Type`, `Version`, `Last_Training_Date`, and `Accuracy`.
  - **Data Analyst**: Provides insights into data managed within the system.
- **Key Relationships**:
  - The **Data Analyst** interacts with the **AI Model** by feeding data and ensuring its performance aligns with the requirements.

3. Supply and Manufacturing

- **Entities**:
  - **Sensor Manufacturer**: Supplies hardware for data collection.
  - **Technology Provider**: Attributes include `Provider_ID`, `Provider_Name`, `Technology_Type`, `Location`, `Contact_Info`, `Partnership_Date`, and `Service_Level`.
- **Key Relationships**:
  - These providers supply and maintain the necessary components, such as **IoT Sensors**, that interact with the **Control System**.

4. Core Infrastructure

- **Entities**:
  - **Control System**: Includes attributes like `Control_ID`, `Greenhouse_ID`, `Control_Type`, and `Status`.
  - **IoT Sensor**: Plays a vital role in data generation.
  - **Actuator**: Controlled by the system for automated environmental adjustments.
  - **Data**: Generated and analyzed by other system components.
- **Key Relationships**:
  - The **Control System** controls and interacts with **Actuators** and **IoT Sensors**, ensuring seamless data flow and automated actions within the greenhouse.

5. Monitoring and Control

- **Entities**:
  - **Alert**: Created based on monitored conditions.
  - **Climate Condition**: Monitored and controlled for optimal crop growth.
  - **Mobile Application**: Attributes include `App_ID`, `User_ID`, `Version`, and `Last_Update`.
- **Key Relationships**:
  - The **Mobile Application** allows users to monitor and manage **Climate Conditions**, facilitating real-time data interaction and alert management.

6. Maintenance and Operation

- **Entities**:
  - **User**: Contains attributes such as `User_ID`, `Greenhouse_ID`, `Name`, `Role`, `Email`, `Password`, `Phone`, and `Address`.

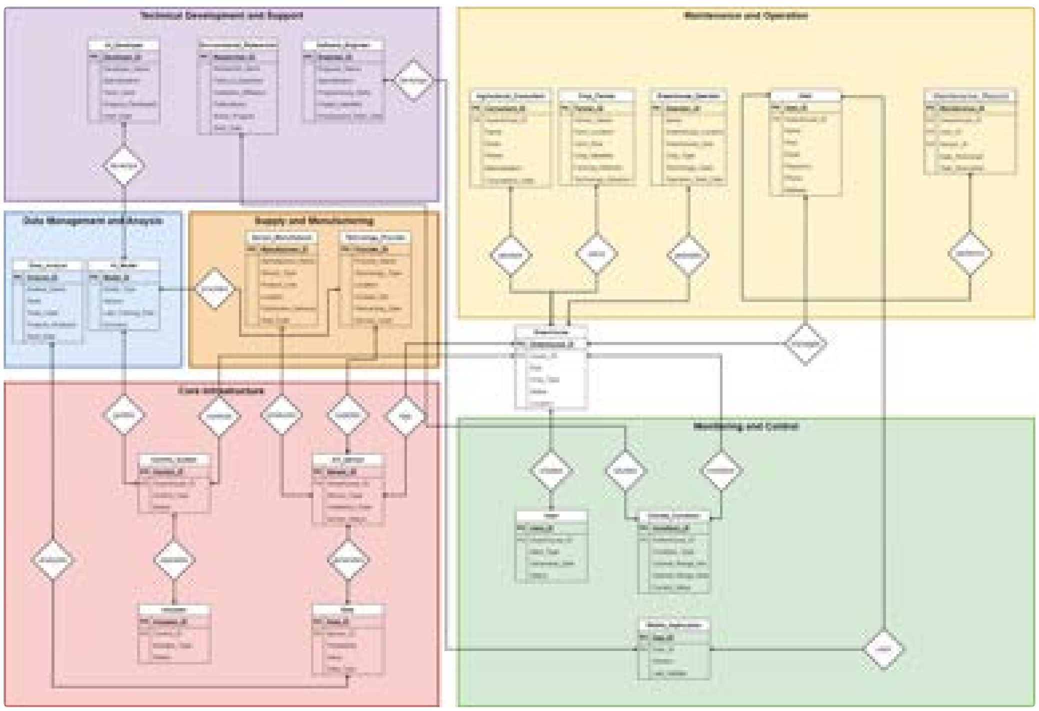
- **Greenhouse Operator**, **Crop Farmer**, **Agricultural Consultant**: Play roles in maintaining and advising on greenhouse operations.
- **Maintenance Record**: Keeps track of maintenance activities performed by operators.

- **Key Relationships**:
  - **Users** manage the greenhouse, perform maintenance, and use the **Mobile Application** for operational control. Maintenance records are updated by **Greenhouse Operators** to ensure the system's health and functionality.

Conclusion

The logical ERD for the Elysium project provides a comprehensive and structured representation of how different entities relate and interact within the system. It ensures that all necessary data structures are in place for smooth operation, data integrity, and scalability. This design will be the blueprint for the forthcoming physical design, which will map these relationships and attributes to specific database structures and storage details.

Physical Design



Introduction

The physical design of the Elysium project's Entity-Relationship Diagram (ERD) translates the logical model into a detailed blueprint that specifies how data is stored and managed within the database system. This design includes tables, attributes, and relationships, focusing on primary keys (PK), foreign keys (FK), data types, and constraints. The goal is to create a well-structured database that supports the project's Smart Greenhouse system for seamless data flow and robust functionality.

Overview

The physical ERD for Elysium delineates the actual database schema, presenting a comprehensive view of how data will be structured and stored. It builds on the logical model by detailing the attributes of each table, ensuring data consistency and integrity. This design incorporates the relationships between various system components such as data management, technical development, supply and manufacturing, core infrastructure, and maintenance operations.

Detailed Description of the Physical ERD

1. Technical Development and Support

- **Entities**:
  - **AI Developer**: `Developer_ID` (PK), `Developer_Name`, `Specialization`, `Tools_Used`, `Projects_Developed`, `Start_Date`.
  - **Software Engineer**: `Engineer_ID` (PK), `Engineer_Name`, `Specialization`, `Programming_Skills`, `Project_Handled`, `Employment_Start_Date`.
  - **Environmental Researcher**: `Researcher_ID` (PK), `Researcher_Name`, `Field_of_Expertise`, `Institution_Affiliation`, `Publications`, `Active_Projects`, `Start_Date`.
- **Relationships**:
  - Each **AI Developer** and **Software Engineer** develops and contributes to the creation and enhancement of the **AI Model** and associated systems.

2. Data Management and Analysis

- **Entities**:
  - **AI Model**: `Model_ID` (PK), `Model_Type`, `Version`, `Tools_Used`, `Last_Training_Date`, `Accuracy`.
  - **Data Analyst**: `Analyst_ID` (PK), `Analyst_Name`, `Skills`, `Tools_Used`, `Projects_Analyzed`, `Start_Date`.
- **Relationships**:
  - The **Data Analyst** works closely with the **AI Model**, providing critical data insights to ensure continuous improvement and functionality.

3. Supply and Manufacturing

- **Entities**:
  - **Sensor Manufacturer**: `Manufacturer_ID` (PK), `Manufacturer_Name`, `Sensor_Type`, `Product_Line`, `Distribution_Network`, `Start_Date`.
  - **Technology Provider**: `Provider_ID` (PK), `Provider_Name`, `Technology_Type`, `Location`, `Contact_Info`, `Partnership_Date`, `Service_Level`.
- **Relationships**:
  - **Manufacturers** and **Technology Providers** supply essential equipment like **IoT Sensors**, which feed data into the **Core Infrastructure**.

4. Core Infrastructure

- **Entities**:
  - **Control System**: `Control_ID` (PK), `Greenhouse_ID` (FK), `Control_Type`, `Status`.
  - **IoT Sensor**: `Sensor_ID` (PK), `Greenhouse_ID` (FK), `Sensor_Type`, `Installation_Date`, `Sensor_Status`.
  - **Actuator**: `Actuator_ID` (PK), `Control_ID` (FK), `Actuator_Type`, `Status`.
  - **Data**: `Data_ID` (PK), `Sensor_ID` (FK), `Timestamp`, `Value`, `Data_Type`.
- **Relationships**:
  - **IoT Sensors** supply data to the **Control System**, which in turn operates **Actuators** to manage greenhouse conditions.

5. Monitoring and Control

- **Entities**:
  - **Alert**: `Alert_ID` (PK), `Greenhouse_ID` (FK), `Alert_Type`, `Generated_Date`, `Status`.

- **Climate Condition**: `Condition_ID` (PK), `Greenhouse_ID` (FK), `Condition_Type`, `Optimal_Range_Min`, `Optimal_Range_Max`, `Current_Value`.
- **Mobile Application**: `App_ID` (PK), `User_ID` (FK), `Version`, `Last_Update`.

- **Relationships**:
  - The **Mobile Application** interacts with **Climate Conditions** to monitor and send alerts when environmental parameters deviate from optimal ranges.

6. Maintenance and Operation

- **Entities**:
  - **User**: `User_ID` (PK), `Greenhouse_ID` (FK), `Name`, `Role`, `Email`, `Password`, `Phone`, `Address`.
  - **Crop Farmer**: `Farmer_ID` (PK), `Farmer_Name`, `Farm_Location`, `Farm_Size`, `Crop_Varieties`, `Farming_Methods`, `Technology_Adoption`.
  - **Greenhouse Operator**: `Operator_ID` (PK), `Name`, `Greenhouse_Location`, `Greenhouse_Size`, `Crop_Type`, `Technology_Used`, `Operation_Start_Date`.
  - **Agricultural Consultant**: `Consultant_ID` (PK), `Greenhouse_ID` (FK), `Name`, `Specialization`, `Consultation_Date`.
  - **Maintenance Record**: `Maintenance_ID` (PK), `Greenhouse_ID` (FK), `User_ID` (FK), `Sensor_ID` (FK), `Date_Performed`, `Task_Description`.
- **Relationships**:
  - **Users** and **Operators** maintain the greenhouse, updating **Maintenance Records** and managing daily operations to ensure a healthy growth environment.

Conclusion

The physical design of the ERD for the Elysium project provides a comprehensive schema for database implementation. It captures every detail needed for actual database construction, ensuring data integrity, optimized storage, and seamless operation of the Smart Greenhouse system. This detailed schema will guide the database engineers in building a robust system that supports all functional and operational aspects of the project.

Data Flow Diagram (DFD)

Overview

The Data Flow Diagram (DFD) provides a visual representation of the flow of data within the Elysium Greenhouse Management System. The DFD is structured into multiple levels (Level 0, Level 1, and Level 2), each offering increasing levels of detail to illustrate how information moves between different entities, processes, and data stores within the system.

Purpose: The DFD aims to capture and convey the logical flow of data and interactions between system components, users, and external sources. It helps stakeholders, developers, and system analysts understand how data is processed, transformed, stored, and utilized to support key functionalities.

Key Components of the DFD:

1. **External Entities**:
    - **Users**: Represented as an external entity, users interact with the system to perform various actions such as entering data, logging in, and managing greenhouse settings.
    - **Sensors**: Serve as an external data source that provides real-time environmental data to the system.
    - **Admin**: An external entity responsible for system updates and management oversight.
2. **Processes**:
    - **Manage Greenhouse**: The central process in Level 0 that orchestrates data flow and interactions between users, sensors, and system functionalities.
    - **Enter User Details, Validate User Details, Adjust Greenhouse System, and Collect Real-Time Data**: More granular processes depicted in Levels 1 and 2 to show how data is processed for specific system functions.
3. **Data Stores**:
    - **Users Data Storage**: Contains user details and login information, supporting processes related to user authentication and profile management.
    - **Greenhouse Indexes Storage**: Stores environmental data collected from sensors and processed data used for analytics and reporting.
4. **Data Flow**:
    - Data flows illustrate the direction and type of data transferred between processes, external entities, and data stores. For example, the "Send Data" flow from **Sensors** to the **Manage Greenhouse** process demonstrates the transmission of real-time data, while the "User Details" flow between **Users** and **User Data Storage** shows data submission and retrieval for authentication.

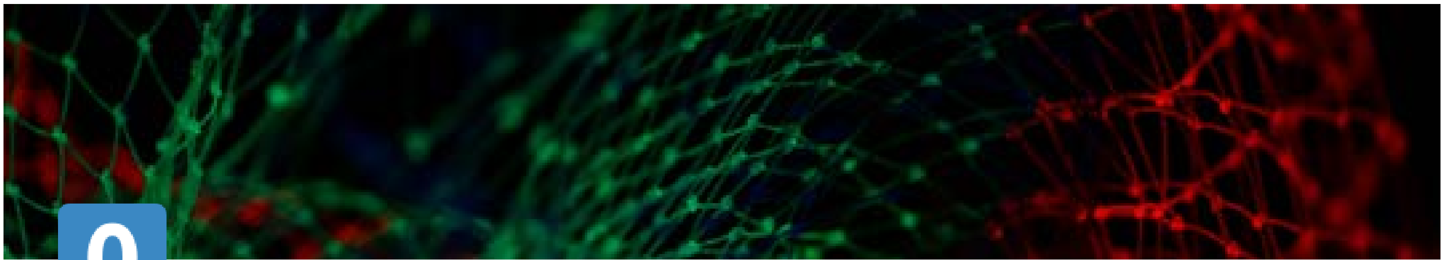
Highlights by DFD Levels:

- **DFD Level 0**: Represents the highest-level view of the system, focusing on the main process of managing greenhouse activities and showing how data flows between core entities (Users, Sensors, Admin) and the central system.
- **DFD Level 1**: Breaks down the main process into detailed sub-processes such as entering and validating user data, adjusting greenhouse systems, and checking real-time conditions. It reveals how user inputs and sensor data are processed to ensure efficient greenhouse operation.

- **DFD Level 2**: Provides an even more granular view, illustrating specific tasks like collecting and filtering sensor data, storing or retrieving data units, and generating alerts or reports. This level showcases interactions that ensure the accuracy of data handling, timely notifications, and operational adjustments based on data-driven insights.

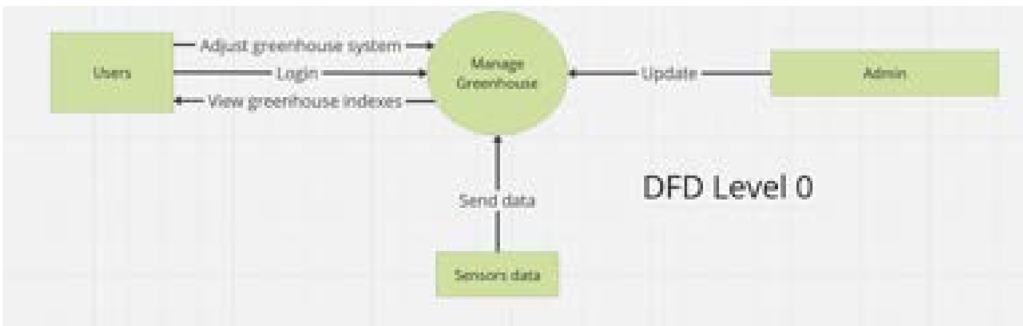
Value to Stakeholders: The DFD is an essential part of system documentation, giving stakeholders a clear understanding of how the Elysium Greenhouse Management System operates from a data perspective. It highlights the interactions required to manage greenhouse conditions effectively, ensuring that all processes are optimized for performance, reliability, and user satisfaction.

This comprehensive visual guide helps in identifying potential enhancements, troubleshooting data flow issues, and ensuring that the system meets both functional and non-functional requirements. It also serves as a foundation for further system development, including database normalization, process optimization, and integration of additional features.



0

Context level



DFD Level 0

Introduction

The Data Flow Diagram (DFD) Level 0 for the Elysium project provides an overarching view of the primary functions and interactions within the Smart Greenhouse system. This high-level representation, also known as a **Context Diagram**, identifies the main data flows between external entities and the core process involved in managing greenhouse operations.

Overview

This DFD Level 0 focuses on the central process, **Manage Greenhouse**, which interacts with various external entities, including **Users**, **Admin**, and **Sensors data**. It highlights the flow of data within the system and how different user roles contribute to and interact with the greenhouse management process.

Detailed Description of DFD Level 0 Components

1. Users

- **Role**: External users, such as farmers or technicians, interact with the greenhouse management system.
- **Data Flow**:
  - **Input**: Users log in and adjust the greenhouse system as needed.
  - **Output**: Users can view greenhouse indexes, which provides valuable insights into current greenhouse conditions.

2. Manage Greenhouse (Central Process)

- **Function**: The main process that manages and oversees all greenhouse operations, including receiving data, adjusting system settings, and providing updates to the relevant stakeholders.

- **Data Flow**:
  - **Input**: Login requests, system adjustments from users, data sent from sensors.
  - **Output**: Updated system data to the admin and greenhouse indexes to users.

3. Sensors Data

- **Role**: Represents the IoT sensors installed in the greenhouse that monitor environmental conditions.
- **Data Flow**:
  - **Output to Process**: Sends real-time data related to temperature, humidity, CO2 levels, soil moisture, and other critical environmental factors to the **Manage Greenhouse** process.

4. Admin

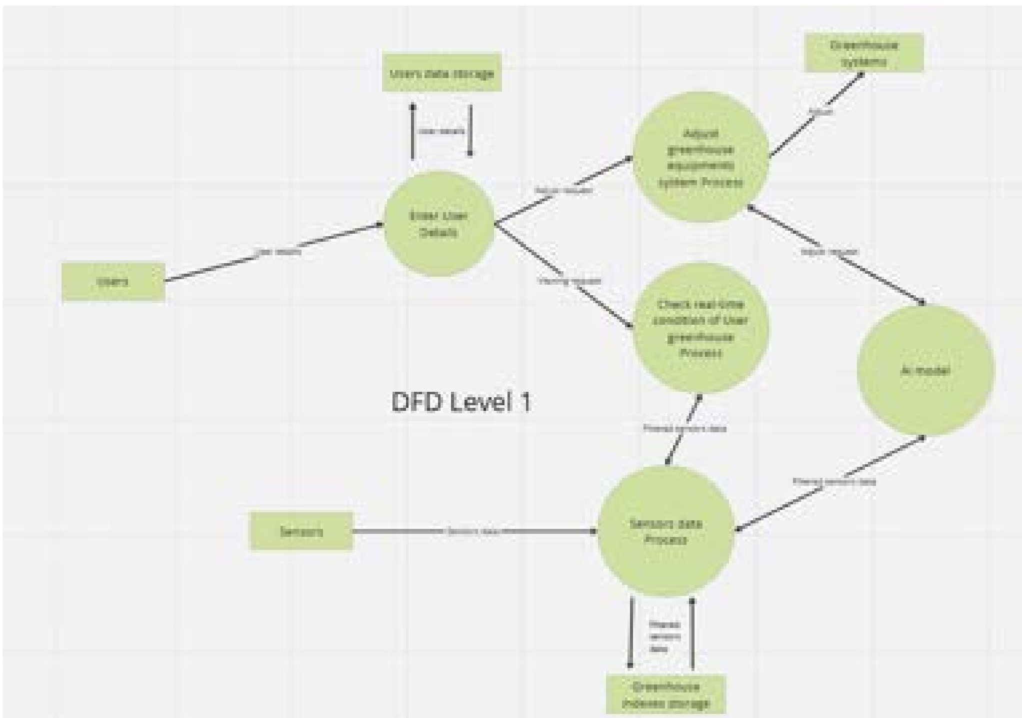
- **Role**: System administrators oversee and update the management process to ensure optimal functioning and maintenance of the greenhouse system.
- **Data Flow**:
  - **Input**: Updates to the greenhouse management process.
  - **Output**: None directly shown in this level, as the primary role is to make system adjustments.

Conclusion

The Level 0 DFD provides a clear, high-level representation of the interaction between external entities and the main greenhouse management process. This diagram lays the groundwork for understanding the basic flow of data and serves as a basis for more detailed breakdowns in subsequent DFD levels, where internal processes will be expanded to reveal greater detail and complexity.

1

Top-Level



DFD Level 1

Introduction

The DFD Level 1 for the Elysium project provides a detailed breakdown of the main process, **Manage Greenhouse**, shown in the DFD Level 0. This diagram illustrates how the process is divided into smaller, more specific sub-processes that interact with external entities and data stores. It gives a clearer view of how data flows within the system, enabling more granular understanding of user interactions, sensor data handling, and system control.

Overview

The Level 1 DFD elaborates on the main functional areas involved in managing the Smart Greenhouse system. These sub-processes handle user data input, sensor data processing, greenhouse adjustments, and real-time condition monitoring. The diagram also showcases data storage components, such as **Users data storage** and **Greenhouse indexes storage**, which help maintain the system's operational integrity.

Detailed Description of DFD Level 1 Components

1. Users

- **Role**: External users who interact with the system to manage and monitor greenhouse conditions.
- **Data Flow**:
  - **Input to Process**: Provides user details and sends requests to adjust or view greenhouse settings.
  - **Output from Process**: Receives processed greenhouse indexes for monitoring purposes.

2. Enter User Details (Process)

- **Function**: Collects and processes user login details and information.
- **Data Flow**:
  - **Input**: User details from the **Users** entity.
  - **Output**: User details stored in **Users data storage** and passed to other processes for verification and system interaction.

3. Users Data Storage

- **Purpose**: A data store that maintains user information for authentication and record-keeping.
- **Data Flow**:
  - **Input**: User details from the **Enter User Details** process.
  - **Output**: Provides user information for validation when accessing other processes.

4. Adjust Greenhouse Equipments System (Process)

- **Function**: Allows users to send requests to modify greenhouse equipment settings, such as temperature control, irrigation, and lighting.
- **Data Flow**:
  - **Input**: Adjust requests from **Enter User Details** and processed data from the **AI model**.
  - **Output**: Sends adjustment commands to the **Greenhouse systems** for implementation.

5. Check Real-Time Condition of User Greenhouse (Process)

- **Function**: Provides users with real-time data about their greenhouse environment.
- **Data Flow**:
  - **Input**: Viewing requests from **Enter User Details** and filtered sensor data from the **Sensors data Process**.
  - **Output**: Displays real-time data to users.

6. Sensors

- **Role**: Collects data on various environmental factors, such as temperature, humidity, and CO_2 levels.
- **Data Flow**:
  - **Output to Process**: Sends sensor data to the **Sensors data Process** for further analysis and storage.

7. Sensors Data Process

- **Function**: Processes incoming sensor data and filters it for use by other processes.
- **Data Flow**:
  - **Input**: Sensor data from **Sensors**.
  - **Output**: Filtered data sent to the **Greenhouse indexes storage** and the **Check real-time condition** process.

8. Greenhouse Indexes Storage

- **Purpose**: Stores processed sensor data for future retrieval and analysis.
- **Data Flow**:
  - **Input**: Filtered sensor data from the **Sensors data Process**.
  - **Output**: Supplies data for user monitoring and decision-making.

9. AI Model

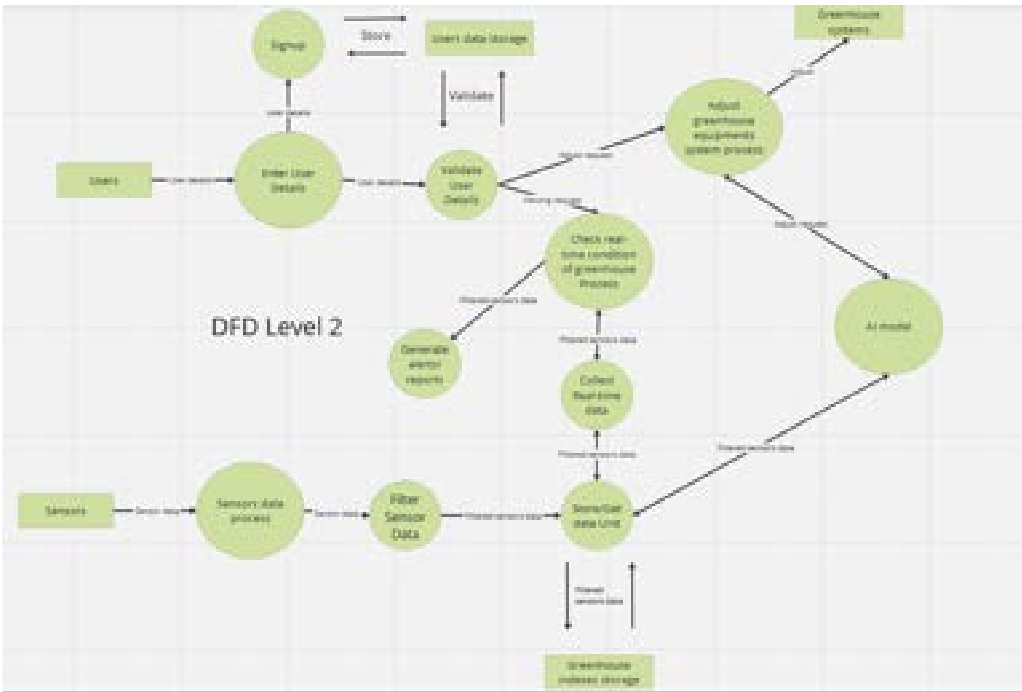
- **Role**: Analyzes filtered sensor data to generate predictive adjustments and optimize greenhouse conditions.
- **Data Flow**:
  - **Input**: Filtered data from the **Sensors data Process**.
  - **Output**: Sends data to the **Adjust Greenhouse Equipments System Process** for automated adjustments.

Conclusion

The DFD Level 1 provides a deeper look into how the Smart Greenhouse system operates, with specific processes managing user input, data analysis, and system adjustments. This level of detail helps identify the interactions and dependencies within the system, facilitating more effective management and optimization of greenhouse conditions. Subsequent DFD levels can break down these processes further to show finer details of data processing and control logic.

2

Detailed level



DFD Level 2

Introduction

The DFD Level 2 for the Elysium project provides an even more detailed representation of the greenhouse management system. It breaks down the sub-processes of the Level 1 DFD into finer activities and interactions, showing the flow of data among various internal processes and external data stores. This level of detail helps outline the specific steps involved in user authentication, sensor data processing, greenhouse control, and report generation.

Overview

DFD Level 2 highlights the intricate workings within the main processes, showcasing how data is validated, processed, stored, and utilized to maintain optimal greenhouse conditions. This level introduces processes such as **User Signup**, **Validate User Details**, **Generate Alerts/Reports**, and **Collect Real-time Data**, which were part of larger processes in DFD Level 1.

Detailed Description of DFD Level 2 Components

1. Users

- **Role**: External users who interact with the system to manage their greenhouse operations.
- **Data Flow**:
  - **Input**: User details for login and requests for viewing or adjusting greenhouse conditions.
  - **Output**: Receives processed outputs and alerts from the system.

2. Enter User Details (Process)

- **Function**: Collects user-provided details for login and system interaction.
- **Data Flow**:
  - **Input**: User details from **Users**.
  - **Output**: Sends user details to the **Signup** process and **Validate User Details** for authentication and storage.

3. Signup

- **Function**: Handles the registration and initial storage of user data.
- **Data Flow**:
  - **Input**: User details from **Enter User Details**.
  - **Output**: Stores user data in **Users data storage** for future access.

4. Validate User Details

- **Function**: Authenticates user data and grants access to the system.
- **Data Flow**:
  - **Input**: User details from **Enter User Details** and validation checks from **Users data storage**.
  - **Output**: Sends valid user details to subsequent processes for interaction with the system.

5. Users Data Storage

- **Purpose**: Stores and validates user data for authentication and access management.
- **Data Flow**:
  - **Input**: User details from **Signup**.
  - **Output**: Provides user data for validation.

6. Adjust Greenhouse Equipments System (Process)

- **Function**: Processes user requests to adjust greenhouse equipment settings.
- **Data Flow**:
  - **Input**: Adjustment requests from **Validate User Details** and data from the **AI Model**.
  - **Output**: Sends adjustment commands to **Greenhouse systems**.

7. Check Real-time Condition of Greenhouse (Process)

- **Function**: Monitors and provides real-time data about greenhouse conditions.
- **Data Flow**:
  - **Input**: Viewing requests from **Validate User Details** and filtered data from **Collect Real-time Data**.
  - **Output**: Displays real-time data to users.

8. Collect Real-time Data (Process)

- **Function**: Collects real-time data from greenhouse sensors.
- **Data Flow**:
  - **Input**: Filtered sensor data from **Filter Sensor Data**.
  - **Output**: Sends collected data to **Check Real-time Condition of Greenhouse** and **Store/Get Data Unit**.

9. Generate Alerts/Reports (Process)

- **Function**: Generates alerts and reports based on real-time data to notify users of critical conditions.
- **Data Flow**:
  - **Input**: Filtered sensor data from **Collect Real-time Data**.
  - **Output**: Sends alerts to users and stores reports in relevant data stores.

10. Sensors

- **Role**: Collects raw environmental data for greenhouse monitoring.
- **Data Flow**:
  - **Output to Process**: Sends raw data to the **Sensors Data Process**.

11. Sensors Data Process

- **Function**: Receives raw data from sensors and passes it to the **Filter Sensor Data** process for further analysis.
- **Data Flow**:
  - **Input**: Raw sensor data from **Sensors**.
  - **Output**: Sends data to **Filter Sensor Data**.

12. Filter Sensor Data

- **Function**: Filters and processes sensor data to remove noise and extract useful information.
- **Data Flow**:
  - **Input**: Sensor data from **Sensors Data Process**.
  - **Output**: Sends filtered data to **Collect Real-time Data** and **Store/Get Data Unit**.

13. Store/Get Data Unit

- **Function**: Stores filtered sensor data and provides it for system processes.
- **Data Flow**:
  - **Input**: Filtered sensor data from **Filter Sensor Data**.
  - **Output**: Supplies data to **Greenhouse Indexes Storage** and other processes as needed.

14. Greenhouse Indexes Storage

- **Purpose**: Stores processed greenhouse indexes for access and analysis.
- **Data Flow**:
  - **Input**: Data from **Store/Get Data Unit**.
  - **Output**: Supplies data to processes requiring historical or real-time information.

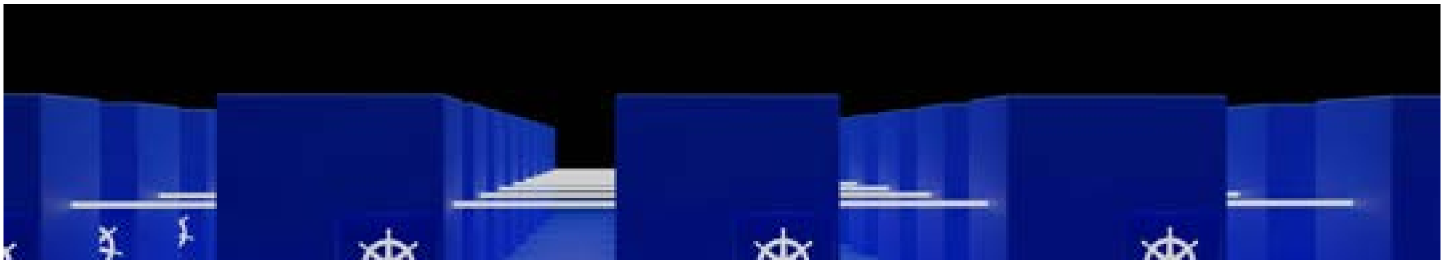
15. AI Model

- **Role**: Analyzes data and provides insights or adjustment recommendations to optimize greenhouse operations.
- **Data Flow**:

- **Input**: Filtered data from **Store/Get Data Unit**.
- **Output**: Sends analysis results to **Adjust Greenhouse Equipments System Process**.

Conclusion

The DFD Level 2 offers an in-depth view of how data flows between different processes in the Smart Greenhouse system. It emphasizes the interaction between user authentication, sensor data processing, real-time monitoring, and system control. This level of detail is crucial for understanding the internal mechanisms that ensure the system's functionality and effectiveness in maintaining optimal greenhouse conditions.



Databases

This document outlines the key stages involved in managing a database system, with a primary focus on using MySQL within phpMyAdmin. The process is structured into four main phases, each contributing significantly to the overall database lifecycle:

1. **Database Construction (Phase 1)**:

The first phase focuses on establishing the database through the use of SQL commands. This stage includes defining the database schema, creating tables, specifying fields, and establishing relationships among the entities. Effective schema design is essential to ensure that the database can support the required data and interactions efficiently.

2. **Dummy Data Creation (Phase 2)**:

The second phase deals with populating the database with sample data, which simulates realistic information for development and testing purposes. Tools such as Fabricate can be employed to generate representative data. This step ensures that the database contains enough realistic records to replicate real-world scenarios for testing the functionality and performance of queries.

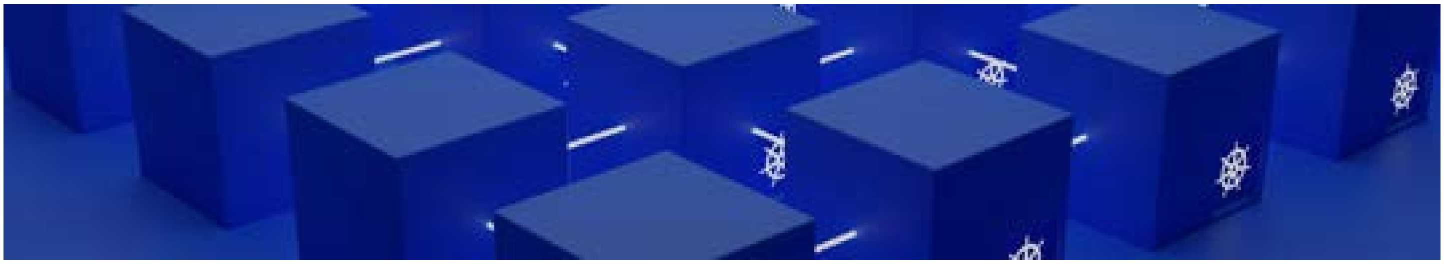
3. **Use Cases (Query) (Phase 3)**:

In the third phase, SQL queries are utilized to extract specific information related to greenhouse management activities and processes. This phase focuses on writing and executing SQL queries that can retrieve valuable insights from the database, aiding in reporting, generating summaries, and performing analysis. This step plays a vital role in supporting strategic decisions and operational improvements.

4. **Index Implementation for Enhanced Performance (Final Phase)**:

The final phase is centered around enhancing the efficiency of database queries by creating indexes. By indexing key columns, data retrieval operations are sped up, which optimizes query performance. During this phase, attention is given to selecting the appropriate fields for indexing to strike a balance between improved query speed and the additional maintenance required for indexes during data updates or changes.

These phases collectively ensure a robust and well-managed database system, facilitating optimal performance and meaningful data utilization in the Elysium project’s Smart Greenhouse system.



🛠️Database Construction

Overview

This section provides an overview of the database creation process for the greenhouse management system. The design and structure of the database were based on an earlier Physical Entity Relationship Diagram (ERD), which served as a blueprint for implementing a robust, efficient, and well-organized physical database.

The database creation script elaborates beyond the ERD, defining specific data types for each field to ensure data consistency, accuracy, and optimized storage. Key features such as primary and foreign keys have been defined to establish strong relationships between tables, facilitating efficient data retrieval and maintaining data integrity across the system.

These additional specifications, including constraints and indices, enhance the database's stability, ensuring it can handle complex queries, large datasets, and concurrent access without compromising performance. The database structure is tailored to meet the unique needs of the greenhouse management system, supporting various functionalities like monitoring environmental conditions, managing maintenance records, and tracking sensor data. This foundational setup provides a solid base for efficient data handling, scalability, and future expansion of the system’s capabilities.

Tables Creation

```
-- Table: User (Create first as it is referenced by Greenhouse)
CREATE TABLE User (
    User_ID INT AUTO_INCREMENT PRIMARY KEY,
    Name VARCHAR(255) NOT NULL,
    Role VARCHAR(50) NOT NULL,
    Email VARCHAR(100) NOT NULL UNIQUE,
    Password VARCHAR(255) NOT NULL,
    Phone VARCHAR(20),
    Address VARCHAR(255)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;

-- Table: Greenhouse (Now it can reference User table)
CREATE TABLE Greenhouse (
```

```sql
    Greenhouse_ID INT AUTO_INCREMENT PRIMARY KEY,
    Location VARCHAR(255) NOT NULL,
    Size FLOAT NOT NULL CHECK (Size > 0),
    Crop_Type VARCHAR(100) NOT NULL,
    Status ENUM('Active', 'Inactive', 'Under Maintenance') DEFAULT 'Active',
    Owner_ID INT NOT NULL,
    FOREIGN KEY (Owner_ID) REFERENCES User(User_ID)
        ON DELETE CASCADE ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;

-- Table: IoT Sensor
CREATE TABLE IoT_Sensor (
    Sensor_ID INT AUTO_INCREMENT PRIMARY KEY,
    Sensor_Type VARCHAR(100) NOT NULL,
    Greenhouse_ID INT NOT NULL,
    Installation_Date DATE NOT NULL,
    Sensor_Status ENUM('Active', 'Inactive') DEFAULT 'Active',
    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)
        ON DELETE CASCADE ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;

-- Table: Data
CREATE TABLE Data (
    Data_ID INT AUTO_INCREMENT PRIMARY KEY,
    Sensor_ID INT NOT NULL,
    Timestamp DATETIME NOT NULL,
    Value FLOAT NOT NULL,
    Data_Type VARCHAR(100) NOT NULL,
    FOREIGN KEY (Sensor_ID) REFERENCES IoT_Sensor(Sensor_ID)
        ON DELETE CASCADE ON UPDATE CASCADE
```

```sql
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: AI Model

CREATE TABLE AI_Model (

    Model_ID INT AUTO_INCREMENT PRIMARY KEY,

    Model_Type VARCHAR(100) NOT NULL,

    Version VARCHAR(50) NOT NULL,

    Last_Training_Date DATE NOT NULL,

    Accuracy FLOAT NOT NULL CHECK (Accuracy BETWEEN 0 AND 1)

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Control System

CREATE TABLE Control_System (

    Control_ID INT AUTO_INCREMENT PRIMARY KEY,

    Greenhouse_ID INT NOT NULL,

    Control_Type VARCHAR(100) NOT NULL,

    Status ENUM('Active', 'Inactive') DEFAULT 'Active',

    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)

        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Mobile Application

CREATE TABLE Mobile_Application (

    App_ID INT AUTO_INCREMENT PRIMARY KEY,

    Version VARCHAR(50) NOT NULL,

    Last_Update DATE NOT NULL,

    User_ID INT NOT NULL,

    FOREIGN KEY (User_ID) REFERENCES User(User_ID)

        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;
```

```
-- Table: Alert

CREATE TABLE Alert (

    Alert_ID INT AUTO_INCREMENT PRIMARY KEY,

    Greenhouse_ID INT NOT NULL,

    Alert_Type VARCHAR(100) NOT NULL,

    Generated_Date DATE NOT NULL,

    Status ENUM('Resolved', 'Pending') DEFAULT 'Pending',

    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)

        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Actuator

CREATE TABLE Actuator (

    Actuator_ID INT AUTO_INCREMENT PRIMARY KEY,

    Actuator_Type VARCHAR(100) NOT NULL,

    Status ENUM('Active', 'Inactive') DEFAULT 'Active',

    Control_ID INT NOT NULL,

    FOREIGN KEY (Control_ID) REFERENCES Control_System(Control_ID)

        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Climate Condition

CREATE TABLE Climate_Condition (

    Condition_ID INT AUTO_INCREMENT PRIMARY KEY,

    Condition_Type VARCHAR(100) NOT NULL,

    Optimal_Range_Min FLOAT NOT NULL,

    Optimal_Range_Max FLOAT NOT NULL,

    Current_Value FLOAT,

    Greenhouse_ID INT NOT NULL,

    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)

```

```sql
        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Maintenance Record

CREATE TABLE Maintenance_Record (

    Maintenance_ID INT AUTO_INCREMENT PRIMARY KEY,

    Greenhouse_ID INT NOT NULL,

    User_ID INT NOT NULL,

    Date_Performed DATE NOT NULL,

    Task_Description VARCHAR(255),

    Sensor_ID INT,

    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)

        ON DELETE CASCADE ON UPDATE CASCADE,

    FOREIGN KEY (User_ID) REFERENCES User(User_ID)

        ON DELETE CASCADE ON UPDATE CASCADE,

    FOREIGN KEY (Sensor_ID) REFERENCES IoT_Sensor(Sensor_ID)

        ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Technology Provider

CREATE TABLE Technology_Provider (

    Provider_ID INT AUTO_INCREMENT PRIMARY KEY,

    Provider_Name VARCHAR(255) NOT NULL,

    Technology_Type VARCHAR(100),

    Location VARCHAR(255),

    Contact_Info VARCHAR(100),

    Partnership_Date DATE,

    Service_Level VARCHAR(100)

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Greenhouse Operator
```

```
CREATE TABLE Greenhouse_Operator (

    Operator_ID INT AUTO_INCREMENT PRIMARY KEY,

    Name VARCHAR(255) NOT NULL,

    Greenhouse_Location VARCHAR(255),

    Greenhouse_Size FLOAT NOT NULL,

    Crop_Type VARCHAR(100) NOT NULL,

    Technology_Used VARCHAR(255),

    Operation_Start_Date DATE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Crop Farmer

CREATE TABLE Crop_Farmer (

    Farmer_ID INT AUTO_INCREMENT PRIMARY KEY,

    Farmer_Name VARCHAR(255) NOT NULL,

    Farm_Location VARCHAR(255),

    Farm_Size FLOAT NOT NULL,

    Crop_Varieties VARCHAR(255),

    Farming_Methods VARCHAR(100),

    Technology_Adoption VARCHAR(100)

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Software Engineer

CREATE TABLE Software_Engineer (

    Engineer_ID INT AUTO_INCREMENT PRIMARY KEY,

    Engineer_Name VARCHAR(255) NOT NULL,

    Specialization VARCHAR(100),

    Programming_Skills VARCHAR(255),

    Projects_Handled VARCHAR(255),

    Employment_Start_Date DATE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;
```

```
-- Table: Environmental Researcher

CREATE TABLE Environmental_Researcher (

    Researcher_ID INT AUTO_INCREMENT PRIMARY KEY,

    Researcher_Name VARCHAR(255) NOT NULL,

    Field_of_Expertise VARCHAR(100),

    Institution_Affiliation VARCHAR(255),

    Publications VARCHAR(255),

    Active_Projects VARCHAR(255),

    Start_Date DATE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: AI Developer

CREATE TABLE AI_Developer (

    Developer_ID INT AUTO_INCREMENT PRIMARY KEY,

    Developer_Name VARCHAR(255) NOT NULL,

    Specialization VARCHAR(100),

    Tools_Used VARCHAR(255),

    Projects_Developed VARCHAR(255),

    Start_Date DATE

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;


-- Table: Sensor Manufacturer

CREATE TABLE Sensor_Manufacturer (

    Manufacturer_ID INT AUTO_INCREMENT PRIMARY KEY,

    Manufacturer_Name VARCHAR(255) NOT NULL,

    Sensor_Type VARCHAR(100),

    Product_Line VARCHAR(255),

    Location VARCHAR(255),

    Distribution_Network VARCHAR(255),

```

```
    Start_Date DATE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;
-- Table: Data Analyst
CREATE TABLE Data_Analyst (
    Analyst_ID INT AUTO_INCREMENT PRIMARY KEY,
    Analyst_Name VARCHAR(255) NOT NULL,
    Skills VARCHAR(255),
    Tools_Used VARCHAR(255),
    Projects_Analyzed VARCHAR(255),
    Start_Date DATE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;
-- Table: Agricultural Consultant
CREATE TABLE Agricultural_Consultant (
    Consultant_ID INT AUTO_INCREMENT PRIMARY KEY,
    Name VARCHAR(255) NOT NULL,
    Email VARCHAR(100),
    Phone VARCHAR(20),
    Specialization VARCHAR(100),
    Greenhouse_ID INT,
    Consultation_Date DATE,
    FOREIGN KEY (Greenhouse_ID) REFERENCES Greenhouse(Greenhouse_ID)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;
```

Conclusion

This database creation section details the structural foundation of the greenhouse management system, supporting essential functionalities like monitoring environmental conditions, managing maintenance activities, and tracking sensor data. By implementing specific data types, constraints, and indexing strategies, we have built a stable, efficient, and scalable database that aligns closely with the operational needs of the system.

The design follows best practices in relational database design, including the use of primary and foreign keys to enforce data integrity and enhance query performance. Each table and its associated relationships have been carefully structured based on an earlier Physical Entity Relationship Diagram (ERD) to support logical data associations and seamless data retrieval. This thorough planning ensures that the database is not only robust and secure but also well-prepared for future growth and evolving application requirements.

With the database's efficient design, stakeholders can expect optimized performance in terms of data handling, minimal redundancy, and faster query responses. This strong foundation empowers the greenhouse management system to handle large datasets and complex queries, laying the groundwork for more advanced analytics, reporting, and decision-making capabilities. Regular maintenance, monitoring, and optimization will ensure the database continues to perform effectively as the system scales and new features are introduced.

🗄️Dummy Data Creation

Overview

This section provides an overview of the tools and processes used to generate dummy data for our greenhouse management system. The creation of realistic and comprehensive dummy data is essential for thoroughly testing and validating the functionality of our database and application in a controlled environment that simulates real-world operations.

As part of our greenhouse management system development, we required a diverse and interconnected set of data to mimic real-world conditions. This data includes information on users, greenhouses, sensors, maintenance records, environmental conditions, alerts, technology providers, and other relevant entities.

Tool Functionality: Fabricate in Mockaroo

Fabricate, a powerful tool within Mockaroo, allows us to create custom and realistic datasets tailored to our application's specific requirements. With Fabricate, we can define schemas, specify data types, and establish relationships between tables to generate large, realistic datasets. This flexibility ensures that our generated data closely aligns with the actual data patterns and characteristics expected in a greenhouse management context.

Data Generation Process

1. **Defining Schemas**: Before using Fabricate, we meticulously designed schemas for each table in our database, including fields, data types, constraints, and inter-table relationships. This step was crucial in setting a foundation for realistic data generation.
2. **Fabricate Configuration**: Using Fabricate’s configuration options in Mockaroo, we set up data generation rules that align with our predefined schemas. This included specifying data types, creating realistic distributions for values, and establishing relationships across tables, such as linking greenhouses to their respective owners and sensors to their greenhouse locations.
3. **Meaningful and Realistic Data**: To ensure the dummy data is relevant and representative of real greenhouse operations, we used Fabricate’s features to populate fields with realistic names, environmental readings, maintenance logs, and timestamps. This approach helps create data that mirrors the unique demands and characteristics of a real greenhouse management system.
4. **Interconnected Tables**: Fabricate’s relational capabilities enable us to establish connections across tables, ensuring data consistency and authenticity. Relationships between greenhouses, sensors, maintenance records, and alerts were carefully configured to reflect the data flow and dependencies within our system. This interconnected approach allows us to simulate the dynamic interactions and dependencies that would occur in a live environment.

With Fabricate, we have been able to generate meaningful dummy data that aids in robust testing and validation of the greenhouse management system. This setup provides a reliable foundation for testing the system’s functionalities and preparing for real-world deployment.

Tables Creation

1. Actuator Table

Actuator_ID	Actuator_Type	Status	Control_ID
1	Shade Control Actuator	Pending	100
2	Water Pump Actuator	Inactive	37
3	Nutrient Delivery Actuator	Inactive	72
4	Plant Monitoring Actuator	Maintenance	20
5	Plant Monitoring Actuator	Idle	26
6	Shade Control Actuator	Idle	79
7	Solar Tracking Actuator	Active	96
8	Heat Mat Actuator	Idle	9
9	Lighting Actuator	Pending	98
10	Shade Control Actuator	Maintenance	38
11	Plant Monitoring Actuator	Decommissioned	76
12	Humidity Control Actuator	Inactive	55
13	Solar Tracking Actuator	Decommissioned	37
14	Shade Control Actuator	Pending	98
15	Greenhouse Door Actuator	Idle	7
16	Humidity Control Actuator	Pending	85
17	Water Pump Actuator	Active	29
18	Air Circulation Actuator	Maintenance	69
19	Water Pump Actuator	Pending	36
20	Nutrient Delivery Actuator	Faulty	88
21	CO2 Level Actuator	Pending	8
22	Nutrient Delivery Actuator	Idle	72
23	Ventilation Actuator	Active	39
24	Floor Heating Actuator	Maintenance	66
25	Solar Tracking Actuator	Pending	72
26	Floor Heating Actuator	Faulty	26
27	Humidity Control Actuator	Maintenance	19

28	Nutrient Delivery Actuator	Inactive	33
29	CO2 Level Actuator	Inactive	26
30	Fogging Actuator	Pending	99
31	Ventilation Actuator	Inactive	4
32	Floor Heating Actuator	Active	94
33	Heat Mat Actuator	Inactive	93
34	Greenhouse Door Actuator	Idle	69
35	Temperature Control Actuator	Maintenance	7
36	Rollup Curtain Actuator	Idle	44
37	Rollup Curtain Actuator	Faulty	39
38	Automated Weeder Actuator	Active	26
39	Temperature Control Actuator	Decommissioned	94
40	Solar Tracking Actuator	Pending	99
41	Ventilation Actuator	Inactive	50
42	Irrigation Actuator	Idle	61
43	Lighting Actuator	Decommissioned	70
44	Nutrient Delivery Actuator	Inactive	90
45	Air Circulation Actuator	Pending	16
46	Temperature Control Actuator	Faulty	93
47	Ventilation Actuator	Faulty	46
48	Nutrient Delivery Actuator	Idle	100
49	Solar Tracking Actuator	Inactive	39
50	Floor Heating Actuator	Idle	94
51	Fogging Actuator	Decommissioned	88
52	Water Pump Actuator	Pending	52
53	Shade Control Actuator	Idle	49
54	Plant Monitoring Actuator	Idle	51

55	Water Pump Actuator	Active	95
56	Irrigation Actuator	Decommissioned	3
57	Solar Tracking Actuator	Maintenance	25
58	Air Circulation Actuator	Decommissioned	77
59	CO2 Level Actuator	Decommissioned	16
60	CO2 Level Actuator	Maintenance	23
61	Floor Heating Actuator	Idle	69
62	Water Pump Actuator	Active	27
63	Fogging Actuator	Inactive	60
64	Shade Control Actuator	Maintenance	68
65	Water Pump Actuator	Inactive	69
66	Fogging Actuator	Active	3
67	Humidity Control Actuator	Inactive	16
68	Rollup Curtain Actuator	Faulty	70
69	Greenhouse Door Actuator	Decommissioned	26
70	Lighting Actuator	Faulty	78
71	Air Circulation Actuator	Inactive	45
72	Plant Monitoring Actuator	Faulty	92
73	CO2 Level Actuator	Faulty	61
74	Temperature Control Actuator	Faulty	38
75	Fogging Actuator	Active	90
76	Rollup Curtain Actuator	Inactive	19
77	Automated Weeder Actuator	Faulty	73
78	Humidity Control Actuator	Inactive	12
79	Mist Sprayer Actuator	Maintenance	78
80	Lighting Actuator	Decommissioned	69
81	Cooling System Actuator	Idle	34
82	Lighting Actuator	Faulty	31

83	Humidity Control Actuator	Maintenance	10
84	Nutrient Delivery Actuator	Pending	92
85	Water Pump Actuator	Active	73
86	Solar Tracking Actuator	Idle	61
87	Cooling System Actuator	Idle	37
88	Rollup Curtain Actuator	Maintenance	74
89	Solar Tracking Actuator	Inactive	63
90	Air Circulation Actuator	Maintenance	51
91	Greenhouse Door Actuator	Active	87
92	Automated Weeder Actuator	Maintenance	22
93	Irrigation Actuator	Faulty	98
94	Solar Tracking Actuator	Decommissioned	5
95	Rollup Curtain Actuator	Pending	74
96	Irrigation Actuator	Pending	2
97	Fogging Actuator	Active	63
98	Mist Sprayer Actuator	Idle	70
99	Water Pump Actuator	Maintenance	53
100	Temperature Control Actuator	Faulty	44

2. Agriculture_Consultant

Consultant_ID	Name	Email	Phone	Specialization	Greenhouse_ID	Consultation_Date
1	Wernher Simonaitis	wernher.simonaitis@yahoo.com	(214) 807-1823	Livestock Management	70	2024-07-20T12:30:35+00:00
2	Wally MacKimmie	wally.mackimmie@hotmail.com	(317) 459-4748	Plant Pathology	97	2024-10-27T22:06:55+00:00
3	Ker Jeanes	ker.jeanes@yahoo.com	(303) 959-2117	Agricultural Economics	85	2024-09-12T12:53:47+00:00

4	Wyatan Onraet	wyatan.onraet@gmail.com	(806) 405-4091	Agricultural Marketing	41	2024-04-04T12:42:57+00:00
5	Godiva Gye	godiva.gye@yahoo.com	(360) 828-1600	Agroecology	37	2024-03-21T10:12:10+00:00
6	Robbin Bendell	robbin.bendell@gmail.com	(701) 441-1767	Agroecology	19	2024-01-15T09:02:38+00:00
7	Shalne Harbord	shalne.harbord@gmail.com	(910) 565-4022	Irrigation Systems	98	2024-08-31T12:26:05+00:00
8	Garth Stent	garth.stent@hotmail.com	(612) 962-8001	Irrigation Systems	59	2024-11-01T10:48:59+00:00
9	Rollie Weinham	rollie.weinham@aliceadsl.fr	(763) 317-7293	Farm Management	53	2024-06-04T12:53:53+00:00
10	Annora Beumant	annora.beumant@hotmail.fr	(417) 176-8292	Environmental Science	52	2024-05-18T11:47:14+00:00
11	Robbi Clendennen	robbi.clendennen@gmail.com	(901) 942-1506	Agricultural Economics	55	2024-05-15T14:31:30+00:00
12	Cammie Vaughn	cammie.vaughn@yahoo.co.in	(213) 508-0031	Livestock Management	80	2024-05-27T21:17:21+00:00
13	Josephina Ekkel	josephina.ekkel@gmail.com	(502) 569-5697	Pest Management	44	2024-08-26T20:58:26+00:00
14	Ivan Tomek	ivan.tomek@aim.com	(978) 219-2549	Plant Pathology	48	2024-01-06T20:15:10+00:00
15	Lisette Dafter	lisette.dafter@gmail.com	(208) 975-7472	Agronomy	47	2024-04-16T04:28:15+00:00

16	Preston Willisch	preston.willisch@hotmail.com	(713) 563-5219	Agricultural Marketing	37	2024-05-01T10:40:51+00:00
17	Kip Longhurst	kip.longhurst@aol.com	(608) 343-3049	Sustainable Agriculture	90	2024-03-20T22:42:29+00:00
18	Ethel Di Carli	ethel.dicarli@uol.com.br	(214) 517-5770	Agricultural Economics	99	2024-10-02T22:55:08+00:00
19	Johan Willmot	johan.willmot@aol.com	(513) 277-0143	Soil Science	84	2024-11-03T12:17:25+00:00
20	Dina Patkin	dina.patkin@gmail.com	(202) 579-6661	Farm Management	22	2024-09-09T18:46:11+00:00
21	Lawrence Gutch	lawrence.gutch@yahoo.com	(425) 119-2575	Soil Science	97	2024-07-18T20:41:14+00:00
22	Gracia Caulton	gracia.caulton@yahoo.com	(619) 410-5593	Agricultural Marketing	11	2024-01-26T02:58:08+00:00
23	Clio Kyndred	clio.kyndred@yahoo.com	(574) 523-3310	Agroecology	41	2024-10-26T02:54:58+00:00
24	Sarine Kimmins	sarine.kimmins@hotmail.com	(317) 862-9129	Irrigation Systems	33	2023-12-16T08:01:51+00:00
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43	Bernarr Bernade	bernarr.bernade@gmx.de	(412) 571-0292	Organic Farming	98	2024-09-24T07:08:57+00:00
44	Tobe Capron	tobe.capron@gmail.com	(615) 955-8382	Agronomy	28	2024-05-10T21:12:23+00:00
45	Shirlene Eronie	shirlene.eronie@hotmail.com	(253) 963-5549	Plant Pathology	7	2024-02-23T13:13:27+00:00
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49	Evan Fealty	evan.fealty@hotmail.com	(949) 365-6897	Livestock Management	23	2024-10-30T18:58:53+00:00
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58	Hercule Bibey	hercule.bibey@hotmail.com	(804) 706-6819	Organic Farming	26	2024-02-08T16:51:55+00:00
59	Gregoor O'Gaven	gregoor.o'gaven@aol.com	(504) 973-5628	Livestock Management	75	2024-09-08T03:45:02+00:00
60	Rustin Pie	rustin.pie@yahoo.com.br	(813) 028-3119	Pest Management	62	2024-01-13T06:08:07+00:00
61	Kirk Lofty	kirk.lofty@home.nl	(907) 251-9694	Agroecology	23	2024-01-29T11:29:26+00:00
62	Alie Owenson	alie.owenson@hotmail.co.uk	(763) 726-6282	Agroecology	14	2024-10-14T20:03:49+00:00
63	August McGuigan	august.mcguigan@hotmail.com	(901) 033-7705	Agricultural Marketing	87	2024-03-18T22:18:23+00:00
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65	Noel Edward	noel.edward@yahoo.com	(661) 846-6023	Precision Agriculture	75	2024-10-19T23:51:42+00:00

66	Krista Bramall	krista.bramall@yahoo.co.in	(336) 514-8902	Sustainable Agriculture	98	2024-09-07T17:31:11+00:00
67	Candida Gerling	candida.gerling@hotmail.com	(336) 542-0869	Agronomy	60	2024-04-21T22:12:45+00:00
68	Cris Kloss	cris.kloss@outlook.com	(207) 039-2412	Organic Farming	53	2024-02-26T16:10:49+00:00
69	Katine Kearford	katine.kearford@yahoo.com	(801) 586-9702	Organic Farming	56	2023-11-10T18:47:38+00:00
70	Wilie Keaton	wilie.keaton@neuf.fr	(307) 300-2960	Sustainable Agriculture	57	2024-05-13T23:57:33+00:00
71	Eb Elwel	eb.elwel@yahoo.com	(305) 590-4298	Pest Management	71	2024-08-25T22:17:27+00:00
72	Danny Hearnes	danny.hearnes@hotmail.com	(202) 760-0537	Irrigation Systems	31	2024-02-24T06:32:50+00:00
73	Barris Baszkiewicz	barris.baszkiewicz@yahoo.fr	(814) 278-1394	Sustainable Agriculture	35	2023-11-30T22:04:36+00:00
74	Brita Durbin	brita.durbin@yahoo.com	(702) 307-9535	Irrigation Systems	25	2024-06-05T04:02:29+00:00
75	Xenos Eyckelberg	xenos.eyckelberg@hotmail.es	(202) 612-3047	Irrigation Systems	89	2024-06-05T03:57:16+00:00
76	Hilde Evill	hilde.evill@hotmail.com	(619) 652-2906	Crop Management	58	2024-05-05T13:46:17+00:00
77	Natal Frenchum	natal.frenchum@yahoo.com	(281) 619-8386	Precision Agriculture	98	2024-10-09T14:07:20+00:00

78	Ethan McGlone	ethan.mcglone@yahoo.com	(253) 428-2142	Plant Pathology	70	2024-11-09T10:27:49+00:00
79	Hoyt Torrent	hoyt.torrent@gmail.com	(717) 553-7089	Agronomy	33	2024-02-10T22:50:41+00:00
80	Timmy Gascoyen	timmy.gascoyen@aol.com	(253) 232-4567	Livestock Management	2	2024-01-29T01:48:35+00:00
81	Irma De Filippo	S Domain Details Page filippo@yahoo.com	(718) 267-3031	Plant Pathology	28	2024-08-06T13:29:45+00:00
82	Janeen Aizikovitch	janeen.aizikovitch@hotmail.com	(862) 938-5819	Sustainable Agriculture	71	2024-06-20T23:26:57+00:00
83	Jillie Bellsham	jillie.bellsham@neuf.fr	(651) 098-9354	Crop Management	21	2024-01-29T08:47:40+00:00
84	Adlai Hiscocks	adlai.hiscocks@gmail.com	(704) 182-4408	Horticulture	67	2024-09-22T02:11:45+00:00
85	Beverlee Hollingsby	beverlee.hollingsby@gmail.com	(937) 024-8370	Agroecology	59	2024-10-26T10:05:07+00:00
86	Gregorius Sidaway	gregorius.sidaway@gmail.com	(619) 126-1175	Agroecology	58	2024-08-09T03:27:44+00:00
87	Betty Budden	betty.budden@hotmail.com	(850) 170-2895	Soil Science	100	2024-10-31T22:26:33+00:00
88	Rooney Brittle	rooney.brittle@hetnet.nl	(912) 210-1020	Agroecology	41	2024-06-27T01:08:57+00:00
89	Janeva Salery	janeva.salery@yahoo.com	(954) 106-9168	Soil Science	26	2024-06-15T03:46:37+00:00
90	Kate Hitchens	kate.hitchens@yahoo.com	(713) 640-0017	Pest Management	48	2024-05-18T15:59:47+00:00

91	Ariana Tootal	ariana.tootal@gmail.com	(504) 064-1940	Pest Management	74	2024-05-31T07:47:04+00:00
92	Lazare Ingarfield	lazare.ingarfield@hotmail.com	(919) 441-5625	Agroecology	73	2024-06-03T04:12:23+00:00
93	Dalton Secrett	dalton.secrett@orange.fr	(507) 694-7009	Pest Management	33	2024-07-23T12:22:30+00:00
94	Annnora Arnaldi	annnora.arnaldi@yahoo.com	(253) 872-1164	Organic Farming	42	2023-12-27T01:28:23+00:00
95	Melissa Ovendon	melissa.ovendon@hotmail.com	(216) 573-6726	Farm Management	16	2024-02-29T05:51:20+00:00
96	Romonda Emberton	romonda.emberton@aol.com	(770) 057-8185	Agronomy	26	2024-03-14T10:39:19+00:00
97	Reina Dreigher	reina.dreigher@hotmail.com	(256) 060-0216	Horticulture	28	2024-02-07T21:48:09+00:00
98	Aldus Beaudry	aldus.beaudry@gmail.com	(305) 471-2781	Livestock Management	34	2024-09-28T17:12:59+00:00
99	Janetta Critchlow	janetta.critchlow@gmail.com	(937) 581-1133	Irrigation Systems	22	2024-04-21T22:44:00+00:00
100	Hadleigh Duddell	hadleigh.duddell@wanadoo.fr	(202) 285-7772	Agricultural Economics	53	2024-06-07T20:16:24+00:00

3. AI_Developer

Developer_ID	Developer_Name	Specialization	Tools_Used	Projects_Developed	Start_Date
1	Quintin Karran	AI for Healthcare	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-08-10T23:10:03+00:00
2	Kimball Woofinden	AI for IoT	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-02-18T02:11:03+00:00
3	Harlin Ugolotti	Data Science	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-05-07T15:29:49+00:00
4	Johny Demchen	AI Ethics	AWS SageMaker, Docker, Python	FarmAI: Precision agriculture advisory platform	2024-06-20T13:07:00+00:00
5	Ulrick Males	AI for Healthcare	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-01-17T01:07:17+00:00

6	Kristyn Paskin	Computer Vision	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-05-11T21:33:26+00:00
7	Winston Lozano	AI Ethics	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-05-30T05:15:22+00:00
8	Dore Petrovic	Neural Networks	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-11-04T02:09:01+00:00
9	Abbey Guillerman	AI in Education	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-08-29T06:18:46+00:00
10	Katrina MacScherie	Computer Graphics	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-07-10T06:43:57+00:00
11	Timmy Coping	Reinforcement Learning	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-07-09T17:42:09+00:00
12	Abbie Clitherow	AI in Education	MATLAB, Simulink, Stateflow	AutoDrive: Autonomous vehicle simulation framework	2024-04-15T03:47:25+00:00
13	Gregorio Benda	Deep Learning	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-03-12T12:41:55+00:00
14	Antony Boggon	AI for IoT	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning tool for analyzing server logs	2024-08-10T08:36:32+00:00
15	Keelby Benneton	AI in Education	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-10-29T05:52:47+00:00
16	Guinna Havercroft	AI Ethics	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-05-17T22:27:14+00:00

17	Marlowe Ridge	Robotics	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-02-05T16:48:27+00:00
18	Marna Taill	AI for IoT	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-08-20T21:14:53+00:00
19	Michail Mundee	Deep Learning	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning tool for analyzing server logs	2024-03-15T13:18:41+00:00
20	Delmar Wyllt	Speech Recognition	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-09-23T10:25:16+00:00
21	Emalee Berkelay	Deep Learning	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource prediction using machine learning	2024-04-01T08:42:03+00:00
22	Johnna Giraudy	Neural Networks	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-10-15T23:29:07+00:00
23	Cariotta Indge	AI for IoT	AWS SageMaker, Docker, Python	FarmAI: Precision agriculture advisory platform	2024-06-12T12:14:29+00:00
24	Arne Ballinger	AI in Education	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-08-26T04:46:44+00:00
25	Sheela Clay	Natural Language Processing	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-10-30T22:44:20+00:00
26	Inger Du Barry	AI Ethics	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2023-12-10T00:33:51+00:00
27	Hadlee Liddall	Neural Networks	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-05-16T14:54:40+00:00
28	Deanna Evered	AI in Finance	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text	2024-06-05T14:38:06+00:00

				summarization service	
29	Janifer Yuryshev	AI for Healthcare	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-07-24T13:05:02+00:00
30	Roderick Baldwin	Machine Learning	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-07-08T06:34:11+00:00
31	Cher Houlden	AI in Education	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2023-11-09T16:40:42+00:00
32	Hinze Derle	Robotics	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-05-21T22:24:45+00:00
33	Debee Cobbing	Neural Networks	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-11-01T16:15:15+00:00
34	Mortimer Keymer	Speech Recognition	MATLAB, Simulink, Stateflow	AutoDrive: Autonomous vehicle simulation framework	2024-06-05T03:38:35+00:00
35	Sarita Bigland	AI Ethics	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-10-12T23:04:03+00:00
36	Bryce Bransdon	Machine Learning	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning tool for analyzing server logs	2024-04-30T17:49:27+00:00
37	Maddalena Cusick	Data Science	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2023-11-23T23:56:39+00:00
38	Nickie Cowitz	Robotics	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-02-22T19:44:06+00:00

39	Conant De la Perrelle	AI in Finance	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-02-03T02:28:23+00:00
40	Tabitha Couper	Robotics	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-07-30T12:08:20+00:00
41	Mose Deverille	AI in Education	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-01-24T03:37:15+00:00
42	Constantina Emlyn	Machine Learning	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource prediction using machine learning	2024-08-27T21:23:27+00:00
43	Hastie Samson	Reinforcement Learning	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource prediction using machine learning	2024-10-18T21:16:09+00:00
44	Ailina Seydlitz	Deep Learning	AWS SageMaker, Docker, Python	FarmAI: Precision agriculture advisory platform	2023-11-10T00:43:18+00:00
45	Jaquelyn Louche	Neural Networks	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-04-04T12:39:03+00:00
46	Evelin Neve	Computer Vision	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-03-27T21:30:57+00:00
47	Leighton Blakeway	Speech Recognition	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-06-07T05:53:27+00:00
48	Ingaborg Druhan	Neural Networks	AWS SageMaker, Docker, Python	FarmAI: Precision agriculture advisory platform	2024-01-07T04:06:08+00:00
49	Wenona Freear	Neural Networks	MATLAB, Simulink, Stateflow	AutoDrive: Autonomous vehicle simulation framework	2024-10-09T05:24:52+00:00
50	Pennie Sherrard	Reinforcement Learning	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for	2024-05-26T17:33:05+00:00

				secure authentication	
51	Denni Forrester	AI in Education	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-06-10T21:57:58+00:00
52	Brody Mccaull	AI for Healthcare	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-04-20T15:34:22+00:00
53	Chase Bedbury	Speech Recognition	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-10-19T14:59:35+00:00
54	Kaitlyn Rawdall	Computer Vision	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-06-30T07:39:04+00:00
55	Kaylyn Mathissen	Machine Learning	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-10-06T02:59:26+00:00
56	Riva Merrilees	AI in Finance	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-01-18T19:11:38+00:00
57	Christine Whitloe	AI for IoT	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2023-11-16T23:15:38+00:00
58	Thebault Surgeoner	Machine Learning	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-07-27T22:39:58+00:00
59	Tani Baughn	Computer Vision	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-08-26T19:53:35+00:00
60	Teirtza Fowley	Neural Networks	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource prediction using machine learning	2023-11-10T03:05:21+00:00

61	Morgun Bathoe	AI for IoT	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-01-13T18:59:10+00:00
62	Jareb Camidge	Reinforcement Learning	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-05-31T01:06:49+00:00
63	Elfie Wedlake	Natural Language Processing	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2024-08-28T09:32:24+00:00
64	Constanta Littrik	Computer Vision	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2024-04-07T19:00:08+00:00
65	Roland Coaster	Computer Vision	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2023-12-04T06:58:05+00:00
66	Gratia Aikett	AI in Education	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2024-01-12T23:15:47+00:00
67	Luelle Binion	Machine Learning	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2023-12-30T04:05:17+00:00
68	Rodi Rummins	Natural Language Processing	MATLAB, Simulink, Stateflow	AutoDrive: Autonomous vehicle simulation framework	2024-10-31T12:59:23+00:00
69	Jonathan Fromont	Computer Graphics	TensorFlow, Keras, Python	DeepVision: An open-source computer vision library	2023-11-28T13:35:27+00:00
70	Janie Wratten	Natural Language Processing	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning tool for analyzing server logs	2023-12-13T18:46:07+00:00
71	Maisie Winger	Neural Networks	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource prediction using machine learning	2024-09-03T23:52:30+00:00
72	Reba Tebbs	Neural Networks	Azure ML, Jupyter Notebooks, R	CloudForecast: Cloud resource	2023-12-20T04:14:27+00:00

				prediction using machine learning	
73	Winnie Moran	Natural Language Processing	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-06-04T02:45:03+00:00
74	Liva Rembrant	Reinforcement Learning	AWS SageMaker, Docker, Python	FarmAI: Precision agriculture advisory platform	2024-05-24T16:18:51+00:00
75	Lynnett Mapledoram	Robotics	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2023-12-05T00:38:19+00:00
76	Salomone Twitching	Machine Learning	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-04-15T23:17:27+00:00
77	Obie Klimas	Data Science	MATLAB, Simulink, Stateflow	AutoDrive: Autonomous vehicle simulation framework	2024-01-24T05:45:09+00:00
78	Danita Possel	Deep Learning	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2023-11-18T12:20:37+00:00
79	Philomena Kermeen	Reinforcement Learning	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning tool for analyzing server logs	2024-03-02T16:14:12+00:00
80	Stefano Horsburgh	Reinforcement Learning	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-04-02T00:31:38+00:00
81	Von Ovendale	AI in Education	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-04-10T02:37:35+00:00
82	Kristel Deverson	Data Science	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-04-13T09:58:46+00:00
83	Dallis Graalmans	AI for Healthcare	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-11-07T06:19:29+00:00

84	Cindelyn Caffin	AI for Healthcare	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-02-19T18:21:41+00:00
85	Dieter Dedon	Robotics	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-07-05T16:02:10+00:00
86	Neil Braden	AI for IoT	Hugging Face Transformers, Python, FastAPI	ChatSummarizer: AI-driven text summarization service	2024-06-23T17:12:48+00:00
87	Amory Digger	Reinforcement Learning	NVIDIA CUDA, C++, Python	ImageEnhancer: Real-time image enhancement for mobile devices	2024-02-09T01:13:42+00:00
88	Jedd Stookes	AI in Finance	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-08-19T01:54:22+00:00
89	Bobbie Sauter	Deep Learning	Google AutoML, BigQuery, Python	AdOptimizer: Targeted advertising campaign insights platform	2024-04-21T16:13:25+00:00
90	Wilmer Kastel	AI in Finance	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-07-19T01:40:38+00:00
91	Barbee Stocking	Speech Recognition	Apache MXNet, Java, Scala	VoiceAuthenticator: Voice biometrics for secure authentication	2024-03-14T05:29:05+00:00
92	Bobbi Hlavac	Robotics	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-07-15T01:40:55+00:00
93	Zsazsa Betjeman	Reinforcement Learning	Apache Flink, Scala, Kinesis	StreamWatcher: Real-time anomaly detection in video streams	2024-10-02T02:41:04+00:00
94	Aliza Aksell	AI for Healthcare	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2024-02-12T23:00:23+00:00
95	Bernie Sleford	AI for Healthcare	Apache Spark, Hadoop, Scala	LogAnalyzer: A machine learning	2024-04-12T05:20:28+00:00

				tool for analyzing server logs	
96	Reed Shutle	Speech Recognition	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2024-07-06T01:32:12+00:00
97	Melvyn Blomfield	AI for Healthcare	Scikit-learn, Pandas, NumPy	DataCleaner: An automated data preprocessing library	2024-07-02T04:19:33+00:00
98	Dehlia Jefcoate	Speech Recognition	R, Shiny, ggplot2	BioInfer: Biological sequence analysis and visualization tool	2024-09-21T20:09:56+00:00
99	Torry Give	Speech Recognition	PyTorch, OpenCV, C++	TranslateBot: A real-time speech translation tool	2024-07-07T19:13:44+00:00
100	Kellyann Besque	Robotics	Tableau, SQL, Python	RetailInsights: Customer behavior analysis in retail sectors	2024-08-02T19:02:55+00:00

4. AI_Model

Model_ID	Model_Type	Version	Last_Training_Date	Accuracy
1	Support Vector Machine	469714615805137850.74331624538790133448847251949841989094415196038910007559396460803521353864 40.525578906348633430542250331211	2024-03-17T06:23:38+00:00	78%
2	Gradient Boosting	506888836043382233960277281073069732653384897148257760431331119415420 79.491074348555640367407295406655712380115424040.17511412279145920508995636503632886617592447210106099748914098748207403064650930565982	2024-01-12T12:42:44+00:00	75%
3	Recurrent Neural Network	8724652523980690400493403958526770702738518257179.623383611343343853414134275959572121105613284531290459 29643.2549436250064027131348528977397544649343860742745945389525	2024-02-17T18:01:49+00:00	87%
4	Naive Bayes	95855585165.284846704180028220619598593299407 5517.0476367638349471771689917945161414757696090458673125508696330130009232	2024-07-06T06:52:33+00:00	89%
5	Decision Tree	57.92545737643271854258117460983018242820972213532018511496010012 57566294.22355812903193536356881	2024-10-25T10:03:38+00:00	85%

		21463224856914101356576474372755770411528000752892956643		
6	Neural Network	6648836893645579248042.5510690822280688699462377743613196937723057156973631405340117465720249349365106788856695536.71406822355417574891836494307589611	2024-08-03T18:53:42+00:00	88%
7	Gradient Boosting	2849180386515038.208201129299440519573630213483658480047124899727271.8094966749263043676386	2024-01-01T18:42:53+00:00	75%
8	Decision Tree	8677768744371637006795692542239785348208945550154252141.715168201736467274859.18330109725573	2024-04-04T14:25:37+00:00	85%
9	K-Nearest Neighbors	527294706654494172178722248561815662650954330721361544963863374422796331846807616078.37359490195430351831435837964436840784054428237146616124492320278784693331341415984880102001.907147335091382870620500573588407179597185639854332778	2024-02-14T00:26:45+00:00	91%
10	Logistic Regression	9602310180889983935424906849142218408691564654430890360058756604046618797737785824046047290588702.0490499282583176446444070017017850905317651247985766497568967658.8240547811334583827747867813637706189410960060091020867659576207521833951473743018834796	2024-11-08T01:37:45+00:00	80%

11	Linear Regression	48703255531425615775036258254773507985188531460481534294335557076484359833183.414964981310243875940105381.18583323922326544208690449114782191070439105	2024-06-24T18:16:32+00:00	72%
12	K-Nearest Neighbors	1309742430145321444838853199.67188836527073588935244074423.99497175738505432425759360221061879888867490075755186813412537525720016114946087716238	2023-12-28T08:39:41+00:00	91%
13	Decision Tree	9355337151204118902649503901027485190.7164345128863826472709859661275829239788606374838318987863439696287.95157666156491662003412	2024-05-14T01:19:26+00:00	85%
14	Support Vector Machine	44801607757457090521817013646328852248363548623462200088612043782898090233945116917042723723.9000970270639102398794054919783940927235978984343385034913914659069683501.6106352240247546772520669920	2024-09-09T14:59:22+00:00	78%
15	Naive Bayes	4860145471994224945442710949063377251065422130960519176776268947341745494221473169.980828702223383523668660926555.64909683635762201288211880007763	2023-12-01T12:09:37+00:00	89%
16	Logistic Regression	3012690842138010050348348547141251356612310257091396868614714879944776840333692799207927293.468010736912687553252703552117472192889061	2024-06-06T17:45:43+00:00	80%

		5292742671314534332844304682178396898459413 18.857434939842641537155942881813528072996001631174543769057981195734911 93		
17	K-Nearest Neighbors	1521388389955100224111460611217572388592231111 22.4009160783.404231856868601025800669971445310052706572924091259105481643367530511014597771342797030115771580955	2024-07-21T15:59:55+00:00	91%
18	Linear Regression	964075488536395071787688258735258291024337110918797011825299146632 2.9758960653548862882720162498008431048207370417033349226330248760510908812368726596 95.88330220339291850347979699753854489219121480221755642893869820105226225790723	2024-02-21T19:34:47+00:00	72%
19	Naive Bayes	727640267430663221815491218510954331195044379402397641535498267544968031483023114942213.000465026565130941237116680047766764316076755489426 0.849734240799353034197588311807712319186305769952530 2814889	2024-03-22T04:39:25+00:00	89%
20	Neural Network	4085796466781999074393393662341511232196220117155261969474843925858563137782244563263903433759471.90024007787821933832078538557913422156369347677958820031285880183665263232627622856297650560 21.991207280498130197	2024-09-25T23:10:47+00:00	88%

		692932459628213059600134543		
21	Support Vector Machine	4678303596978837773092745331496990776660190546500126990388230196929853926929516033849665.64996907928686789503827327909432383924003318558100789574543052890408537944376022852 3111.718330412817	2024-03-10T17:29:47+00:00	78%
22	Support Vector Machine	8940659924492620557290318314980861423212591111184702001004789285048870665495722608818221.00863207217015132259603133809381438824025697651698781705848531079245469032496004304358473388311.2949017235308133515854507589403682759230174616	2024-09-08T07:10:18+00:00	78%
23	Decision Tree	352575698050769657123149332803055031952912636224860812300 55134944615584955.51351589874549241825376824668789473038837255832193257121594647642026445579661565782549727 49.15530732583987461387684998971017021699834957 4257737809003655964 2352	2024-05-23T06:18:52+00:00	85%
24	Gradient Boosting	45901303468738115089024215920039223107752834144557762.59686975644916670225725141606569704763123343886963786489412479601699617678569044 26486501783.53306897 6621642689490826	2023-11-27T13:35:53+00:00	75%
25	Random Forest	23342235639694328274355725803264335470	2024-08-15T00:30:24+00:00	93%

		69922.0683109382602746063315580366400618859242020839455739421.9553350746978414167982368689740409392929643344864703027150757620407091860520261345396054420		
26	Neural Network	8253577409170045469366705.7.459858	2024-08-14T13:07:42+00:00	88%
27	K-Nearest Neighbors	83866492102822144883666.803260372050573725658122909068148286518587784520223992669809187520727554990506169912054.0933352622762274193298091755293073599151130080858300158522008793689949059	2023-12-07T02:55:55+00:00	91%
28	Support Vector Machine	745409227885338790145312013355265770473251937244430788274117030980.105525011853157271055127296074.1914797043945704779354243955	2024-02-22T08:27:30+00:00	78%
29	Logistic Regression	456531811530700106718990957979747968848701088227414347267021901117656.6336169953814661545256724466457538064410038599947457.8686165272026944798981746677394816451976705908220429318298314272555739598417347391014398869161	2024-03-04T23:28:55+00:00	80%
30	Naive Bayes	872317233192198665091380648585521097770141766193623278691362331959975545816357601598456767139356.542956182883871944673903681284139676377535773294644702714343562221956392107	2024-03-11T02:47:55+00:00	89%

		1.2334022685308447559653472061137335		
31	Recurrent Neural Network	536592922928218079.09843547686202.5484161310937283901916384911337	2024-05-04T13:56:39+00:00	87%
32	Linear Regression	9365267695027029163187553103751262323149245065950818194586249363791372910259662929695963971502.5316129342905923774150849507874283942195.0888865966843375005483	2023-12-16T06:05:01+00:00	72%
33	Decision Tree	4567743951710410389197132685481571146205938813136648.790874495289117329164.9587489783185440921644742432446496554794504045428126351967378813362073061734582324181237555071314	2024-08-23T21:06:10+00:00	85%
34	Support Vector Machine	4293155360683512908107124726786229674442881177128856265421079761915937460073 99.301826767394.10111260929251328008477516252883739188863025199006255913637980732070614510258479 79935	2024-07-02T08:05:09+00:00	78%
35	Support Vector Machine	76580579612532249584144506351.73704461086750681081037991044975560716614863932071052996660380875759 2104.2023204842971279326796026711817078747034638811	2024-01-22T15:30:52+00:00	78%
36	Neural Network	5928108541695453253224642328772905897679400.067661197578633343716639148903892626180534627699624612535169984369695504531.823674088588429	2024-08-21T04:37:10+00:00	88%

		2584109595245185187973436554427730168281168		
37	Neural Network	27294740831753749661257139473595010325 9682.440765747070518523861777086.90764383446320656216032237611697020073908534807568318194161320992496224622993687001 82	2024-02-27T05:55:10+00:00	88%
38	Logistic Regression	2817824772224291473901703441116021.381896972770064439531231819106045655675788 0112703419.46985379396439673086027506886596316809515856654080288094479588563987825493142492386738 6624	2024-04-12T06:33:06+00:00	80%
39	Logistic Regression	399706047915333189253471416276367889227431532225054842788 7553370245047.467522604.1417109182901188658443829243904696457508074	2024-07-16T05:30:38+00:00	80%
40	Neural Network	197314103694770643593985694177043701492059262869923888634901407549591635.4818194143229628839643159455905594246838828120041207499814956 44874452.32732856876	2024-08-25T16:13:52+00:00	88%
41	Naive Bayes	15246037458579935721303.79280454356921838623667125729116044306721046630199675648065203707486368897811493518869 89.3452350449790660329719 0929618	2024-10-27T10:26:09+00:00	89%
42	Random Forest	361260026167250162926017862897403363453778044809538439765976179.3447964382427	2024-02-18T10:32:15+00:00	93%

		70580096163686886662081877360926280108849026.08234233643496251976510706443248442279840557463974470776492976470181821104		
43	K-Nearest Neighbors	91651037791870319624129827790433961348459366557831924531909544202061133524510805053627363087819.60661.1249284438177596340380462252022643860887310931826900 8660476	2024-05-30T09:39:13+00:00	91%
44	Decision Tree	46085071232733.8112.018623667911	2024-03-01T00:37:14+00:00	85%
45	Recurrent Neural Network	5643012483621297.462425517485042487500821518624418758047.800210084488033092060 06092589	2024-02-21T14:04:20+00:00	87%
46	Neural Network	359172251079329339501256234024123959091648373331398361828114887971082882 09.53978354863793967230932298845236616984998281270381 0.450712187134001906832766146041187904242229573992674200695537175727396966606624025735 92	2024-07-22T18:45:21+00:00	88%
47	Recurrent Neural Network	74865767730999521068392089322876070560204717.205452638223233995732758986667684428325.175035498850439721603320789655968250108167861345237447177818152045078885387130	2024-09-17T01:47:31+00:00	87%
48	Logistic Regression	4211640128232287943279782.96544234628034135603102978183189035931655008152776 3	2024-08-07T01:07:56+00:00	80%

		141.62021541072945161		
49	Neural Network	26319573281357886277862926279103624555478317552013855 9.0758545.582	2024-10-24T11:30:59+00:00	88%
50	Decision Tree	64276543787103737902464342178753319910317502.46595804301096131219940148393164473018923458631833508526019 68.5856705749619596366137824951883127948501965262514185971852505446499055634929370708439691905112956	2024-09-28T11:58:40+00:00	85%
51	Recurrent Neural Network	250531670376098163694107441862163792.9607280628889479213702801642529079.4499610476594839770195542092431724839485004113115236157529079262657571347390972	2024-07-11T13:16:54+00:00	87%
52	Logistic Regression	84632594212098732863683237089781095295900345345.5361749080784374789826415291347279765441789689568968967301063835287404215696390634831 4683.73666813012416003935390355642879939898048127712231993844294339871437967674998323282	2024-06-14T22:56:46+00:00	80%
53	Recurrent Neural Network	38588863719057511760698115750245461204.314262229350080288521088628668528242180740974928503971.918095657958977320938897949177603511233165231245142717581676427335790803867881 24692140135795317	2023-11-27T11:35:34+00:00	87%

54	Linear Regression	255.96190258750108669772878811786.2678576594859102865454016699605472	2024-07-18T16:23:18+00:00	72%
55	Recurrent Neural Network	31493823058013632755341448948661774906289205533929854391026009640563624360208434865265300289.96650432653958296665795747350830132410604518687636901.984582893784457908209266042395518988658867757659340501729302408069234306178102919806	2023-12-22T08:55:01+00:00	87%
56	Neural Network	11977118585768914906107595975888245703477497240213016284928991309307522926028408668669.5249472788674759173647693265322273219544068992493694547493112116624.748416593809086152521144	2024-03-10T00:11:20+00:00	88%
57	Neural Network	45482613325043466424094658373400101609292602338006552475089.922221473155784.4753581693097493348969438048492790868664734495022380508039669921414674322157	2024-07-21T18:04:11+00:00	88%
58	Decision Tree	6042724602382379222293620662423694346473646948543873503763145475513202677962573863349771111644061249.71574358387125270162481789414542716432265442223834428134823499619683184310739.928487086	2024-04-07T11:14:21+00:00	85%
59	K-Nearest Neighbors	1362060969946764739.4291403282344240489189105151643156394786532.63954527795225	2024-04-15T07:29:47+00:00	91%

		96462578074598012270		
60	Decision Tree	629035719710988155894123073538817131067146694382856156522028561423543887116869845039338978292914 17.3336257572322900677935820568548002230065279664 1965.4301974111328185290725150893491254600201869314 40119	2024-04-29T14:18:32+00:00	85%
61	Recurrent Neural Network	119315317257658446983514915016749694838759520455796415047292688097210293138538758315809.158806819448340362.91937106590357	2024-05-09T01:25:54+00:00	87%
62	Gradient Boosting	2227570885795998234205010149555544334819269646216781348896943804271.684678770036915681036562675714673039387130612288184519950238797603069223910985411381080042287324.31028776997839865689993538731501575415724944842050822	2024-09-11T20:45:55+00:00	75%
63	Linear Regression	754993226134059017523922973745732680284377 4735.8285764.19174838821902719302340859714358	2024-04-26T13:15:55+00:00	72%
64	Support Vector Machine	4837391017252431348701241905977764907618907889801955420059660738384955695878864446677055481811747 7.04674635482080037942876043655465396954515069170992507754174023141241836161.7927440545	2024-08-17T07:52:30+00:00	78%

65	Logistic Regression	177409.25064726059580952620732932412902272179437140489352194728511003601045186770463.3792968927491068	2024-10-31T04:44:53+00:00	80%
66	Recurrent Neural Network	159150085388.28800995357911022712492209329120972756242342569781749449228335846141 42.58804722736937150364099288918890696947690631011975439981094473007993378022777	2023-12-15T16:36:07+00:00	87%
67	Decision Tree	9676907852149876390619702458555685961 8.9554909766826426554751103.85722269939273058090	2024-03-31T02:00:00+00:00	85%
68	Linear Regression	8302954890034705099417989649238594947801495594121751 5.96467063301688604273738741838885700005001237450989975440705844553898680143992372710141511800517.611	2024-02-10T04:54:13+00:00	72%
69	Linear Regression	43825788375217196598423991286916873526410346915157817702312404664913424308624866779595055972.646693695746903.07646849358343852173595330 50099856802	2024-02-15T21:20:36+00:00	72%
70	Linear Regression	42141263898541697776703438923917308511131209909889775711388912900919134593.33484662579477254010618144141308841430135660979675574642 1.786612982559890795257623347976765618366594312967298791396299545603840846868611 0016	2024-05-24T02:44:41+00:00	72%

71	Naive Bayes	626303378560873665217.93703572619887122990002752608026900569986835558368840730 9149.46797409407138157212572861719718839872134834744231789 22392480139	2024-10-05T05:10:48+00:00	89%
72	K-Nearest Neighbors	320049882713815761490265434435081204805113947096215456355 33047421.0173880659223286024461202559325701027987097362927 9133891490220.422687166159754290033802613321250598662368504308940243876569953	2024-04-11T10:28:43+00:00	91%
73	K-Nearest Neighbors	359033079816383452170039173683344915928216798784253760355 3201157900589439486282490801387.2844263168506461358675281646559095066141434740027595885937875 7.6651153986431428210054291755664041039975217704837220154570009599394572593544777042312368650	2024-09-30T14:18:10+00:00	91%
74	Recurrent Neural Network	3729082655456283022354495676600845976611541.2416930473464811898748535227762893077332085690010929134223682071207213 18393287514610.0267788771418054838700388003038096849910357284781350562	2024-07-22T11:30:09+00:00	87%
75	Support Vector Machine	5700183402041.9903627656446841317892265187201561175456266799525131908850464449133021000.23789272682149549386	2024-02-17T03:56:06+00:00	78%
76	Recurrent Neural Network	76843895687191.619459.866685160453565621	2024-04-23T05:42:57+00:00	87%

		157595344227484336		
77	Gradient Boosting	8865774978248045991156896041425418685385.479759168890026319562625768288605438409349665681544926147524.89615218156681145316039494756476 3	2023-12-17T15:22:35+00:00	75%
78	Neural Network	2621566848426323226176669568376162470588014051394426565000272811554588502786 31340.819917655618760203561498767276546 23992471876794762.43024733304	2024-10-22T18:18:10+00:00	88%
79	Gradient Boosting	91963663029321913703134214957560159231577310863947432260450815495623692894 4.78032969604103828173568926055669749595189200549313352072046074995293259207136 15451712635649540.195688869016963850218 8380	2024-08-31T04:50:48+00:00	75%
80	Linear Regression	2783590414.3193140324221580436464283627050691228381162625529747475767674102307078696377471.199213308980364736028086173138389754112263228488103338155007948 42764802	2024-10-11T20:20:29+00:00	72%
81	Logistic Regression	61448367555582691598314402553757319186572298394807251614752208712431051131946 98008988.7850437265.161	2023-12-01T12:19:01+00:00	80%

82	Linear Regression	9467648164913944980847637416746086988860341645.72159143580811941834207018729923857604747740707971101468584749477453103530785325568.1658	2024-10-20T07:34:01+00:00	72%
83	Support Vector Machine	53663406182946606027072117797727428070027420.20491203250239054773040884339134568777327232853248294740732744726320335623819.134558707569590924699003634046083983403627741923754614734879259445951519596159533	2024-06-14T19:50:06+00:00	78%
84	K-Nearest Neighbors	581708987111252172745545713687862206054285702234757135880674.272480523668.984991133	2024-03-31T09:53:27+00:00	91%
85	Random Forest	359942256722705363406824930235075401647119152483107975844417749387468248327966084451237124040497.5705477208238352444742517183243692628492618.16378106405542326578707030380032900489	2024-09-29T11:27:16+00:00	93%
86	Decision Tree	282778817124205619194147809922606595919.2505494825101355900295564.301915737313012417622187707391595239483754	2024-04-06T19:02:16+00:00	85%
87	Support Vector Machine	75529421648485581462891957446115171881456654207509452277401330962793606567110088981407069455998817.71845537205012140624186858769531033087161307427.04968600285508910110295998	2024-04-22T01:40:06+00:00	78%

		9471383536844298477907436436727		
88	K-Nearest Neighbors	2050981.1522.06460221585819319608777268	2024-06-10T13:30:36+00:00	91%
89	Support Vector Machine	8.02212286601480882001677.4458530235440679625202756	2024-06-08T04:58:28+00:00	78%
90	Logistic Regression	43049048228949.464567733346717285505553179526.1997398980895744437037205000600077038650400714196543605973336288936	2024-03-23T03:56:02+00:00	80%
91	Gradient Boosting	879832649345.79584126603732180376238588572032078035365460786972072988733784923133005237958323873755265.715429125345357514	2024-10-01T20:32:03+00:00	75%
92	Neural Network	13303596661021083739607529247109127977320897416552263229808331787052.98180706877110466985271379676784988053193933415268.135169191724146274316992562525577687917169220707497679277067141306101243910476779526	2023-12-20T17:08:30+00:00	88%
93	Neural Network	795230950627025331424445981822488094519508039740651378703280470964902762893609022937129147746414.6999155.960210524386397416151335376807787097772848016206903896032676444951795158	2023-12-25T14:36:33+00:00	88%
94	Linear Regression	494285231644049082338049565067361.990903447394610377781976173921215576560242584442089453626041891054775905966650417161700800807.1109661	2023-11-25T14:20:28+00:00	72%

		17204301128804569395344725783941575715812025273853969081384788337560181343817325072452		
95	K-Nearest Neighbors	14454120995694979749073963883140301037069557134010897662188.22936648823664694473333035070804310757187179061391027460.019943623585108633695811743	2024-03-04T04:41:25+00:00	91%
96	Random Forest	6537938115687498321922431171459510393276098.1646144098431798155396680527776.08026953367	2023-12-08T01:31:11+00:00	93%
97	K-Nearest Neighbors	2117891132889782360102056183692572580858834866373182389967690.5941480722797728748164872766951447442218.182014986599793290149512611804973822865505552797875702662	2024-08-22T10:39:35+00:00	91%
98	K-Nearest Neighbors	885115798549174549630269898376989767000438161987522652631.59803776776917148920179043212977750790028133.948439668969080110112616650785215867764555218029121249238	2023-12-03T17:38:14+00:00	91%
99	Naive Bayes	8275249565507544582676591963723411170529189301999797561058017411665819459109779388332694.8375718.996194342258707827992664566021537991839945764459778947984476416822135613315764853	2024-09-14T02:15:23+00:00	89%
100	Logistic Regression	591555984185079736891379210059729923577714339459300240111	2024-10-04T07:59:05+00:00	80%

289724.3926932315170
5447293987353775328
2433848913115911436
2609787854403957490
9996374699656395352.1
3945999895430469

5. Alert

Alert_ID	Greenhouse_ID	Alert_Type	Generated_Date	Status
1	8	Info	2023-12-07T13:23:39+00:00	Pending
2	27	Alert	2024-02-14T05:26:23+00:00	In Progress
3	60	Success	2024-06-13T22:07:17+00:00	Closed
4	99	Notice	2024-11-03T09:19:55+00:00	Escalated
5	97	Error	2024-10-28T07:27:19+00:00	Failed
6	74	Alert	2024-08-03T02:50:12+00:00	Resolved
7	36	Alert	2024-03-17T17:13:55+00:00	Closed
8	70	Alert	2024-07-19T06:40:20+00:00	Acknowledged
9	55	Warning	2024-05-25T08:41:51+00:00	Acknowledged
10	51	Error	2024-05-12T03:09:42+00:00	Closed
11	59	Emergency	2024-06-09T06:22:26+00:00	Closed
12	63	Notice	2024-06-25T05:25:53+00:00	In Progress
13	57	Critical	2024-06-01T20:56:14+00:00	Acknowledged
14	16	Success	2024-06-01T10:35:44+00:00	Escalated
15	48	Error	2024-01-04T19:35:53+00:00	Pending
16	94	Error	2024-05-01T09:51:08+00:00	In Progress
17	72	Debug	2024-10-16T08:43:10+00:00	Resolved
18	6	Notice	2024-07-27T10:40:35+00:00	Acknowledged

19	21	Error	2023-11-28T22:23:54+00:00	Acknowledged
20	36	Critical	2024-01-22T22:33:23+00:00	Failed
21	48	Notice	2024-03-16T18:53:45+00:00	Pending
22	85	Error	2024-05-10T08:02:10+00:00	Closed
23	11	Warning	2024-05-02T03:01:29+00:00	Pending
24	66	Debug	2024-08-06T10:28:37+00:00	Failed
25	11	Error	2023-12-18T10:09:58+00:00	Escalated
26	83	Emergency	2024-07-06T01:33:27+00:00	Closed
27	41	Warning	2023-12-17T19:34:31+00:00	Resolved
28	46	Error	2024-09-06T20:34:54+00:00	Acknowledged
29	7	Notice	2024-10-29T12:03:15+00:00	Pending
30	54	Alert	2024-07-15T07:28:47+00:00	Acknowledged
31	69	Notice	2024-04-24T16:46:31+00:00	Closed
32	50	Success	2023-12-01T18:31:05+00:00	Acknowledged
33	66	Error	2024-05-24T00:16:09+00:00	Closed
34	66	Info	2024-07-17T23:44:00+00:00	Closed
35	76	Critical	2024-05-09T00:42:33+00:00	Failed
36	84	Alert	2024-11-05T19:48:46+00:00	In Progress
37	51	Alert	2024-07-06T01:46:39+00:00	Failed
38	16	Error	2024-07-05T18:15:44+00:00	Acknowledged

39	31	Notice	2024-08-11T03:17:17+00:00	Escalated
40	72	Alert	2024-01-06T17:55:19+00:00	In Progress
41	100	Warning	2024-09-10T12:38:56+00:00	Resolved
42	52	Emergency	2024-05-13T01:21:21+00:00	Acknowledged
43	100	Warning	2024-10-10T17:14:34+00:00	Acknowledged
44	57	Critical	2024-01-04T08:19:53+00:00	Pending
45	9	Notice	2024-02-28T21:22:45+00:00	Failed
46	36	Warning	2024-04-25T04:40:19+00:00	Resolved
47	29	Error	2024-07-27T17:46:44+00:00	Acknowledged
48	45	Error	2024-11-06T11:48:28+00:00	Acknowledged
49	6	Success	2024-05-16T04:11:08+00:00	Pending
50	58	Debug	2024-11-07T22:55:29+00:00	Escalated
51	77	Critical	2024-06-02T03:56:46+00:00	Closed
52	62	Alert	2023-12-10T09:14:57+00:00	Failed
53	50	Alert	2024-08-02T04:40:20+00:00	Closed
54	60	Alert	2024-03-18T19:08:20+00:00	Acknowledged
55	16	Error	2024-04-22T07:47:16+00:00	Closed
56	96	Warning	2024-04-20T00:48:20+00:00	In Progress
57	18	Alert	2023-11-29T02:51:40+00:00	Escalated
58	29	Warning	2024-09-22T07:47:09+00:00	In Progress

59	18	Debug	2024-06-06T12:19:52+00:00	Resolved
60	4	Warning	2024-08-16T07:14:27+00:00	In Progress
61	54	Success	2024-06-22T08:08:05+00:00	Pending
62	87	Debug	2024-05-07T00:55:28+00:00	Acknowledged
63	30	Success	2024-07-22T03:23:36+00:00	Escalated
64	75	Alert	2024-09-15T07:05:59+00:00	Resolved
65	43	Success	2024-01-04T11:35:51+00:00	Closed
66	98	Error	2024-10-22T11:42:10+00:00	Failed
67	14	Emergency	2024-01-11T13:58:34+00:00	Escalated
68	53	Alert	2024-01-12T16:42:36+00:00	Acknowledged
69	50	Info	2023-11-21T19:22:33+00:00	Acknowledged
70	10	Notice	2024-05-22T04:18:42+00:00	Acknowledged
71	85	Critical	2024-09-20T15:57:39+00:00	Pending
72	54	Debug	2024-02-23T21:06:14+00:00	Acknowledged
73	80	Warning	2024-07-15T01:57:44+00:00	Resolved
74	100	Notice	2024-08-08T17:35:12+00:00	Failed
75	1	Emergency	2024-04-13T09:04:46+00:00	Pending
76	61	Warning	2024-05-06T08:17:02+00:00	Closed
77	53	Warning	2024-05-20T04:16:34+00:00	Acknowledged
78	99	Info	2024-05-09T02:15:51+00:00	Failed

79	75	Info	2023-12-14T17:24:42+00:00	Closed
80	61	Notice	2024-05-21T15:20:38+00:00	Closed
81	62	Alert	2024-11-05T11:57:01+00:00	Acknowledged
82	47	Warning	2024-03-27T05:45:34+00:00	Escalated
83	74	Alert	2024-08-26T05:09:09+00:00	Resolved
84	33	Warning	2024-11-07T12:57:32+00:00	In Progress
85	64	Error	2023-11-10T20:50:28+00:00	Failed
86	20	Alert	2024-05-19T20:06:42+00:00	Resolved
87	15	Alert	2024-11-04T19:49:46+00:00	Closed
88	61	Success	2024-08-07T10:26:23+00:00	In Progress
89	13	Warning	2024-06-16T14:57:26+00:00	Resolved
90	81	Emergency	2024-06-20T22:10:49+00:00	Closed
91	15	Info	2024-04-26T05:41:43+00:00	Failed
92	40	Emergency	2024-02-26T22:00:29+00:00	Escalated
93	82	Warning	2024-01-21T06:55:04+00:00	In Progress
94	12	Critical	2024-08-04T22:52:51+00:00	Resolved
95	7	Emergency	2024-03-08T03:42:30+00:00	Failed
96	56	Warning	2024-06-27T05:11:15+00:00	Pending
97	36	Critical	2024-01-20T21:38:06+00:00	Pending
98	62	Warning	2024-02-23T06:43:32+00:00	Acknowledged

99	35	Success	2023-12-31T15:21:37+00:00	Resolved
100	43	Notice	2024-06-17T08:20:03+00:00	Closed

6. Climate_Condition

Condition_ID	Condition_Type	Optimal_Range_Min	Optimal_Range_Max	Current_Value	Greenhouse_ID
1	Cloudy	23	23	23	24
2	Cloudy	26	26	26	27
3	Windy	27	27	27	97
4	Stormy	96	96	96	62
5	Drizzling	61	61	61	33
6	Drizzling	32	32	32	78
7	Sunny	77	77	77	4
8	Windy	91	91	91	63
9	Windy	92	92	92	61
10	Snowy	3	3	3	45
11	Sunny	62	62	62	99
12	Drizzling	60	60	60	70
13	Rainy	44	44	44	29
14	Cloudy	98	98	98	16
15	Overcast	1	1	1	39
16	Rainy	95	95	95	23
17	Rainy	69	69	69	10
18	Snowy	28	28	28	74
19	Foggy	15	15	15	15
20	Overcast	9	9	9	59
21	Overcast	38	38	38	39
22	Sunny	22	22	22	14
23	Snowy	9	9	9	76
24	Hazy	73	73	73	76
25	Snowy	14	14	14	89
26	Overcast	58	58	58	17
27	Sunny	38	38	38	45

28	Overcast	13	13	13	99
29	Windy	42	42	42	85
30	Sunny	52	52	52	41
31	Windy	75	75	75	10
32	Hazy	75	75	75	73
33	Foggy	88	88	88	18
34	Windy	16	16	16	69
35	Cloudy	1	1	1	99
36	Stormy	44	44	44	4
37	Stormy	98	98	98	80
38	Hazy	84	84	84	74
39	Rainy	40	40	40	19
40	Overcast	9	9	9	89
41	Drizzling	72	72	72	64
42	Rainy	17	17	17	2
43	Snowy	68	68	68	39
44	Foggy	98	98	98	66
45	Overcast	3	3	3	79
46	Windy	79	79	79	77
47	Hazy	73	73	73	86
48	Foggy	18	18	18	54
49	Windy	76	76	76	61
50	Stormy	88	88	88	23
51	Overcast	63	63	63	31
52	Rainy	1	1	1	36
53	Stormy	38	38	38	12
54	Rainy	65	65	65	10
55	Drizzling	78	78	78	75
56	Windy	76	76	76	40
57	Drizzling	85	85	85	94
58	Foggy	53	53	53	14
59	Rainy	60	60	60	17

60	Rainy	22	22	22	8
61	Sunny	30	30	30	40
62	Cloudy	35	35	35	99
63	Stormy	80	80	80	43
64	Hazy	11	11	11	52
65	Foggy	9	9	9	71
66	Snowy	74	74	74	85
67	Foggy	39	39	39	30
68	Stormy	93	93	93	55
69	Hazy	13	13	13	67
70	Drizzling	76	76	76	35
71	Rainy	16	16	16	49
72	Windy	7	7	7	71
73	Sunny	39	39	39	70
74	Sunny	98	98	98	10
75	Rainy	42	42	42	15
76	Rainy	51	51	51	39
77	Windy	70	70	70	15
78	Overcast	64	64	64	97
79	Snowy	84	84	84	39
80	Sunny	29	29	29	64
81	Sunny	54	54	54	92
82	Overcast	66	66	66	89
83	Hazy	34	34	34	13
84	Rainy	48	48	48	11
85	Foggy	70	70	70	6
86	Snowy	69	69	69	25
87	Foggy	9	9	9	36
88	Hazy	14	14	14	81
89	Cloudy	33	33	33	54
90	Rainy	69	69	69	39
91	Overcast	38	38	38	42

92	Sunny	14	14	14	52
93	Rainy	48	48	48	9
94	Snowy	96	96	96	50
95	Drizzling	38	38	38	58
96	Overcast	16	16	16	38
97	Foggy	63	63	63	81
98	Windy	91	91	91	97
99	Stormy	88	88	88	64
100	Stormy	54	54	54	87

7. Control_System

Control_ID	Greenhouse_ID	Control_Type	Status
1	57	Closed-loop	Completed
2	74	Feedback-based	Suspended
3	38	Programmable	Unknown
4	63	Distributed	Active
5	100	Automatic	Suspended
6	55	Feedback-based	Completed
7	93	Open-loop	Error
8	2	Automatic	Active
9	38	Semi-Automatic	Suspended
10	62	Semi-Automatic	Pending
11	4	Open-loop	Error
12	38	Distributed	Error
13	18	Open-loop	Pending
14	23	Programmable	Active
15	8	Feedback-based	Active
16	84	Closed-loop	Inactive
17	97	Automatic	Under Review
18	83	Closed-loop	Error
19	18	Automatic	Active
20	56	Programmable	Unknown
21	64	Open-loop	Active

22	75	On-Site	Error
23	8	Automatic	Under Review
24	3	Remote	Completed
25	76	Distributed	Active
26	1	Automatic	Active
27	18	On-Site	Error
28	51	Feedback-based	Suspended
29	81	Remote	Archived
30	87	Programmable	Under Review
31	42	Automatic	Error
32	31	Closed-loop	Active
33	91	Automatic	Completed
34	2	Open-loop	Inactive
35	79	Open-loop	Pending
36	46	Manual	Suspended
37	66	Automatic	Suspended
38	99	Remote	Error
39	32	Manual	Active
40	58	Semi-Automatic	Completed
41	54	Semi-Automatic	Pending
42	6	Remote	Archived
43	76	Programmable	Inactive
44	84	Manual	Pending
45	70	Open-loop	Under Review
46	83	Automatic	Error
47	11	Distributed	Pending
48	5	Programmable	Completed
49	32	Manual	Suspended
50	13	Semi-Automatic	Unknown
51	23	Semi-Automatic	Suspended
52	24	On-Site	Active
53	36	Open-loop	Pending

54	39	Feedback-based	Under Review
55	87	Semi-Automatic	Completed
56	11	Feedback-based	Unknown
57	99	Remote	Inactive
58	81	Distributed	Error
59	7	On-Site	Suspended
60	60	Automatic	Completed
61	96	Programmable	Pending
62	29	Distributed	Pending
63	56	Manual	Active
64	12	Feedback-based	Under Review
65	26	On-Site	Completed
66	22	Remote	Under Review
67	47	Feedback-based	Unknown
68	82	Semi-Automatic	Inactive
69	98	Semi-Automatic	Pending
70	64	Remote	Unknown
71	25	Open-loop	Inactive
72	64	Automatic	Error
73	60	Distributed	Active
74	98	Manual	Error
75	34	Semi-Automatic	Inactive
76	41	Manual	Under Review
77	7	Open-loop	Unknown
78	7	Closed-loop	Completed
79	54	Automatic	Unknown
80	8	Open-loop	Active
81	60	Manual	Under Review
82	94	Distributed	Unknown
83	16	Feedback-based	Pending
84	79	Programmable	Under Review
85	98	Remote	Pending

86	65	Programmable	Error
87	39	Manual	Suspended
88	62	Automatic	Unknown
89	23	Programmable	Archived
90	32	Programmable	Inactive
91	86	Programmable	Archived
92	6	Semi-Automatic	Inactive
93	49	Closed-loop	Archived
94	57	Distributed	Active
95	10	Semi-Automatic	Completed
96	49	Semi-Automatic	Suspended
97	97	Distributed	Inactive
98	90	Closed-loop	Completed
99	30	Manual	Unknown
100	90	Closed-loop	Archived

8. Crop_Farmer

Farmer_ID	Farmer_Name	Farm_Location	Farm_Size	Crop_Varieties	Farming_Methods	Technology_Adoption
1	Artus Brack	12026 Bamberg Avenue, Nashville, Tennessee, United States, 37215	8017	Tobacco	Integrated Pest Management (IPM)	Laggard
2	Maxim Menichelli	975 Monterey Lane, Fresno, California, United States, 93721	650	Wheat	Conventional	Innovative
3	Lidia Northridge	1594 Gaffney Street, Petaluma, California, United States, 94975	1062	Corn	Organic	Innovative
4	Caryl Bony	287 Mi Tierra Way, Mobile, Alabama, United States, 36670	191	Tobacco	Integrated Pest Management (IPM)	Innovative

5	Gussi Peat	12677 Loris Loop, El Paso, Texas, United States, 79928	8451	Sugarcane	Sustainable	Laggard
6	Lutero Ianilli	13294 Greyville Court, Houston, Texas, United States, 77288	8862	Canola	Aeroponic	Laggard
7	Biddie Pimblott	9495 Almanza Drive, Brooklyn, New York, United States, 11220	6330	Sorghum	Sustainable	Late Majority
8	Jacques Cummins	6849 Fair Oak Terrace, Shreveport, Louisiana, United States, 71137	4566	Canola	Integrated Pest Management (IPM)	Early Majority
9	Reynold Duxbury	9540 Madison Lane, Brooklyn, New York, United States, 11247	6360	Tobacco	Hydroponic	Late Majority
10	Cullie Iacobini	12862 Alcazar Court, Des Moines, Iowa, United States, 50305	8575	Soybean	Sustainable	Laggard
11	Charity Bullcock	3986 Lorelei Lane, Albuquerque, New Mexico, United States, 87115	2657	Canola	Integrated Pest Management (IPM)	Early Adopter
12	Morgen Chisnall	5290 Kettering Court, Staten Island, New York, United States, 10310	3526	Cotton	Regenerative	Late Majority
13	Koralle Elphee	9058 Gennesse Lane, Dallas, Texas, United States, 75372	6039	Tobacco	Sustainable	Late Majority
14	Peggi Flatman	10103 Knotty Pine Terrace, Lima, Ohio,	6735	Cotton	Conventional	Laggard

		United States, 45807				
15	Pris Jurisic	12584 Raspberry Court, Albuquerque, New Mexico, United States, 87195	8389	Canola	Biodynamic	Late Majority
16	Arch Brydell	10618 Polacheck Place, Whittier, California, United States, 90610	7078	Barley	Sustainable	Late Majority
17	Preston Rentz	9097 Feliu Run, Oakland, California, United States, 94622	6064	Wheat	Aeroponic	Innovative
18	Fairlie Clampe	2424 Tybee Street, Independence, Missouri, United States, 64054	1616	Millet	Aeroponic	Late Majority
19	Keelby Castelyn	1458 Due West Drive, Reno, Nevada, United States, 89505	972	Canola	Regenerative	Early Majority
20	Diane-marie Kemme	7921 West Street, Shawnee Mission, Kansas, United States, 66225	5281	Sorghum	Hydroponic	Early Majority
21	Hobart Coppens	9302 Southern Trace, Topeka, Kansas, United States, 66606	6201	Sorghum	Biodynamic	Late Majority
22	Muffin Turfs	6240 Velerst Avenue, Toledo, Ohio, United States, 43615	4160	Cotton	Regenerative	Late Majority
23	Hazel Manifold	6261 Valparaiso Street, Macon, Georgia, United States, 31296	4174	Soybean	Sustainable	Late Majority

24	Conney Challen	10657 Odyssey Place, Charlotte, North Carolina, United States, 28247	7105	Rye	Aeroponic	Early Majority
25	Mordecai Erasmus	5113 Royal Pine Court, Tulsa, Oklahoma, United States, 74103	3409	Cotton	Permaculture	Early Adopter
26	Giralda Spendlove	8434 Kittredge Loop, Albuquerque, New Mexico, United States, 87180	5623	Canola	Permaculture	Early Adopter
27	Rhianna Roseburgh	10872 Gatehouse Terrace, Shreveport, Louisiana, United States, 71151	7248	Sorghum	Conventional	Innovative
28	Alysa Fairholme	9079 Currituck Terrace, Peoria, Illinois, United States, 61656	6053	Oats	Regenerative	Innovative
29	Huntley Jopson	6856 Bissell Trail, Sacramento, California, United States, 95894	4570	Oats	Organic	Early Majority
30	Janet Lauder	3874 Leeds Place, Tulsa, Oklahoma, United States, 74184	2583	Soybean	Permaculture	Early Adopter
31	Brendon Whetnall	3425 Jerry Avenue, Milwaukee, Wisconsin, United States, 53263	2284	Wheat	Hydroponic	Early Adopter
32	Prent Speddin	5766 Magnolia Avenue, Montgomery,	3844	Alfalfa	Tillage	Early Adopter

		Alabama, United States, 36104				
33	Melisse Graber	1811 Richard Drive, Wilkes Barre, Pennsylvania, United States, 18768	1207	Corn	Biodynamic	Early Adopter
34	Care Tunbridge	10946 St. Andrews Court, Detroit, Michigan, United States, 48224	7297	Peanuts	Permaculture	Laggard
35	Falito Polley	14816 Callaway Drive, Washington, District of Columbia, United States, 20392	9877	Millet	Aeroponic	Early Adopter
36	Katine Glandon	298 Leggett Lane, Lehigh Acres, Florida, United States, 33972	199	Oats	Organic	Early Majority
37	Shanda Ledgister	11554 Susan Avenue, Athens, Georgia, United States, 30610	7703	Rice	Aeroponic	Innovative
38	Arney Esmonde	7354 Bachman Path, Everett, Washington, United States, 98206	4903	Alfalfa	Conventional	Early Majority
39	Carleen Vannini	3233 Cormorant Terrace, Columbia, South Carolina, United States, 29240	2156	Peanuts	Aeroponic	Early Majority
40	Hugo Peskett	3986 Vinewood Avenue, Ocala, Florida, United States, 34474	2657	Rice	Biodynamic	Late Majority
41	Dionisio Symers	4774 Perry Lane, Houston, Texas, United States, 77045	3183	Sugarcane	Sustainable	Early Majority

42	Alexis Snipe	14403 Tiedemann Loop, Raleigh, North Carolina, United States, 27605	9602	Rye	Sustainable	Late Majority
43	Winfred Gehrels	11684 Amaya Avenue, Washington, District of Columbia, United States, 20414	7789	Rye	Regenerative	Early Majority
44	Madelyn Lelliott	4214 Garden Street, Shreveport, Louisiana, United States, 71137	2809	Oats	Biodynamic	Late Majority
45	Brewster Duval	13073 Enright Place, Denver, Colorado, United States, 80217	8715	Sorghum	Hydroponic	Early Majority
46	Virgina Dashkovich	8020 Brock Court, Birmingham, Alabama, United States, 35242	5347	Barley	Tillage	Early Majority
47	Damita Nicolls	8601 Dill Lane, New Orleans, Louisiana, United States, 70142	5734	Corn	Organic	Early Adopter
48	Rahal Farrington	3263 Brennan Court, Danbury, Connecticut, United States, 06816	2176	Sorghum	Hydroponic	Innovative
49	Jacquette Spaight	6846 Davidson Avenue, San Diego, California, United States, 92153	4564	Barley	Regenerative	Late Majority
50	Burl Divine	2600 Ritch Road, Lexington,	1734	Wheat	Biodynamic	Early Majority

		Kentucky, United States, 40515				
51	Archer Blanch	190 Glen Hollow Way, Charlotte, North Carolina, United States, 28247	127	Sorghum	Integrated Pest Management (IPM)	Laggard
52	Geri Lydden	6762 Stella Street, New York City, New York, United States, 10120	4508	Rye	Regenerative	Early Majority
53	Jaclyn Drohun	2787 Delia Place, Colorado Springs, Colorado, United States, 80935	1858	Alfalfa	Tillage	Innovative
54	Amelia Fawlks	1924 Venable Court, Baltimore, Maryland, United States, 21281	1283	Canola	Regenerative	Laggard
55	Gilberto Gini	6406 Viscaya Court, Las Vegas, Nevada, United States, 89166	4271	Barley	Organic	Early Adopter
56	Katleen Rickesies	8430 Baldeschwieler Way, Watertown, Massachusetts, United States, 02472	5620	Millet	Conventional	Late Majority
57	Lanny Diack	14903 Dyer Court, Oklahoma City, Oklahoma, United States, 73152	9935	Canola	Integrated Pest Management (IPM)	Laggard
58	Rodger Dome	9866 Belle Glade Avenue, Midland, Michigan, United States, 48670	6577	Millet	Regenerative	Early Adopter
59	Valerie Jimes	2531 Red Cedar Lane, Charlotte, North Carolina, United States, 28299	1687	Cotton	Biodynamic	Early Majority

60	Octavia Browell	7174 Monetta Lane, Boston, Massachusetts, United States, 02298	4782	Millet	Regenerative	Laggard
61	Isidoro Guillford	9261 Tuscaloosa Path, Pompano Beach, Florida, United States, 33075	6174	Rye	Integrated Pest Management (IPM)	Early Adopter
62	Gui Beckitt	7064 Allure Loop, Boise, Idaho, United States, 83722	4709	Rice	Hydroponic	Early Adopter
63	Kerrin Le feuvre	10828 Bowersox Drive, Norfolk, Virginia, United States, 23520	7218	Soybean	Regenerative	Early Majority
64	Lazare Ibell	7537 Juneberry Avenue, Little Rock, Arkansas, United States, 72222	5025	Alfalfa	Aeroponic	Early Majority
65	Rex Gurdon	8487 Black Stone Place, Kingsport, Tennessee, United States, 37665	5658	Corn	Tillage	Early Majority
66	Malvina Noble	6960 Soulliere Avenue, Atlanta, Georgia, United States, 30392	4640	Peanuts	Biodynamic	Laggard
67	Parnell Steere	4427 Enrique Drive, Dayton, Ohio, United States, 45414	2951	Rice	Conventional	Early Adopter
68	Cad Buscombe	5436 Robbins Road, Minneapolis, Minnesota, United States, 55470	3624	Cotton	Permaculture	Innovative
69	Jody Paolozzi	14097 Began Place, Nashville, Tennessee,	9398	Millet	Tillage	Laggard

		United States, 37215				
70	Rheba Inge	426 Pickering Path, Detroit, Michigan, United States, 48211	284	Tobacco	Aeroponic	Early Majority
71	Yalonda Ondrak	11834 Ridgewood Path, Philadelphia, Pennsylvania, United States, 19184	7889	Millet	Integrated Pest Management (IPM)	Early Majority
72	Cheryl Schoffler	4921 Freedom Court, Herndon, Virginia, United States, 22070	3281	Peanuts	Permaculture	Early Adopter
73	Boris De Lasci	10546 Will Lane, Portland, Oregon, United States, 97221	7031	Alfalfa	Conventional	Late Majority
74	Reggi Scading	7716 Beckett Run, Anaheim, California, United States, 92805	5144	Peanuts	Regenerative	Late Majority
75	Lorrayne Ganforthe	5963 Draughton Court, San Diego, California, United States, 92115	3975	Corn	Tillage	Early Adopter
76	Sherline Brewerton	12029 Penman Place, Corpus Christi, Texas, United States, 78405	8019	Wheat	Tillage	Early Majority
77	Eartha Placido	7333 Barron Place, Portland, Oregon, United States, 97211	4888	Tobacco	Regenerative	Early Adopter
78	Clareta Rutherfoord	11354 Scarboro Court, Saint Louis, Missouri, United States, 63116	7569	Rye	Integrated Pest Management (IPM)	Late Majority

79	Rebbecca Benion	14019 Mir Place, Lancaster, Pennsylvania, United States, 17622	9346	Peanuts	Aeroponic	Early Majority
80	Ettie Gartrell	11010 Adriana Way, Miami, Florida, United States, 33158	7340	Peanuts	Regenerative	Laggard
81	Ninon Cottrell	791 Echols Court, Cincinnati, Ohio, United States, 45254	527	Rice	Tillage	Early Majority
82	Etan Faragher	1880 Whitetail Avenue, Amarillo, Texas, United States, 79165	1254	Cotton	Biodynamic	Early Majority
83	Hobey Coulling	12374 Bissell Trail, Atlanta, Georgia, United States, 30336	8249	Tobacco	Permaculture	Laggard
84	Killy Stollenbeck	10997 Barnacle Terrace, Denver, Colorado, United States, 80217	7331	Rice	Conventional	Early Majority
85	Bonita Langdon	8150 Gage Street, Pittsburgh, Pennsylvania, United States, 15240	5433	Barley	Regenerative	Innovative
86	Doretta Brammer	11212 Knight Avenue, Baton Rouge, Louisiana, United States, 70805	7474	Peanuts	Sustainable	Innovative
87	Paul Haime	11541 Norfolk Avenue, Ogden, Utah, United States, 84409	7694	Sorghum	Sustainable	Early Adopter
88	Gaile Sandeson	4065 Sweetwater Terrace, Saint Joseph,	2710	Sugarcane	Aeroponic	Early Adopter

		Missouri, United States, 64504				
89	Anselm Laingmaid	10348 Loma Paseo Drive, Chicago, Illinois, United States, 60646	6899	Rye	Integrated Pest Management (IPM)	Laggard
90	Mason Wattisham	12125 Rugby Way, Milwaukee, Wisconsin, United States, 53220	8083	Barley	Biodynamic	Early Majority
91	Kristal Benedettini	4857 Van Deen Place, Wilmington, Delaware, United States, 19810	3238	Soybean	Hydroponic	Innovative
92	Cecily Kyteley	2599 Wake Forest Lane, Miami, Florida, United States, 33245	1733	Alfalfa	Integrated Pest Management (IPM)	Early Majority
93	Tanny Driscoll	11436 Colleen Court, Grand Rapids, Michigan, United States, 49518	7624	Oats	Conventional	Early Majority
94	Annadiana Bassill	6602 Del Rio Drive, Silver Spring, Maryland, United States, 20918	4402	Rice	Aeroponic	Laggard
95	Win Goggin	13729 Barclay Court, Hartford, Connecticut, United States, 06152	9152	Millet	Hydroponic	Early Majority
96	Hartley Halton	8078 Lammer Lane, Lakewood, Washington, United States, 98498	5385	Millet	Organic	Early Adopter
97	Lesley Gillivrie	2305 San Salvador Drive, Shreveport, Louisiana,	1537	Barley	Hydroponic	Innovative

		United States, 71115				
98	Ilene Trehearne	5591 Ives Lane, New Haven, Connecticut, United States, 06520	3727	Alfalfa	Permaculture	Early Majority
99	Margo Panniers	14791 Lisette Way, Fargo, North Dakota, United States, 58106	9861	Sorghum	Hydroponic	Early Adopter
100	Rhonda Sherborne	3478 Phillips Court, El Paso, Texas, United States, 79955	2319	Barley	Conventional	Early Majority

9. Data

Data_ID	Sensor_ID	Timestamp	Value	Data_Type
1	90	2024-09-04T11:55:48+00:00	819	Blob
2	83	2024-10-02T13:56:00+00:00	896	Datetime
3	24	2024-09-06T08:33:04+00:00	824	JSON
4	65	2024-08-02T03:06:21+00:00	728	Datetime
5	8	2024-02-04T03:32:56+00:00	236	String
6	77	2024-07-03T16:06:49+00:00	647	Float
7	69	2023-12-06T12:13:05+00:00	73	Boolean
8	18	2024-08-14T13:30:36+00:00	762	String
9	36	2024-07-16T12:34:32+00:00	682	Blob
10	39	2024-08-09T23:17:47+00:00	749	Integer
11	27	2024-01-10T21:37:19+00:00	170	Blob
12	83	2023-12-12T08:42:09+00:00	89	Float
13	15	2024-03-18T08:48:56+00:00	354	Boolean
14	91	2024-03-28T23:48:39+00:00	383	String
15	5	2024-02-14T04:39:13+00:00	263	Blob

16	83	2024-09-06T16:26:07+00:00	825	Datetime
17	86	2024-01-01T10:32:52+00:00	144	JSON
18	87	2024-10-05T00:54:42+00:00	902	Float
19	95	2023-11-24T13:17:06+00:00	40	Boolean
20	97	2024-09-06T15:19:50+00:00	825	Boolean
21	26	2024-10-03T21:19:10+00:00	899	String
22	74	2023-12-08T03:43:41+00:00	77	Date
23	16	2024-09-16T10:13:53+00:00	851	JSON
24	49	2024-07-30T02:37:58+00:00	719	Blob
25	8	2023-12-23T07:53:32+00:00	119	Integer
26	73	2024-09-20T20:15:54+00:00	863	JSON
27	92	2023-12-19T07:20:58+00:00	108	Boolean
28	66	2023-12-19T11:40:49+00:00	108	Date
29	79	2024-10-19T23:33:48+00:00	943	Float
30	40	2024-03-27T11:29:43+00:00	379	Integer
31	87	2024-10-28T07:31:09+00:00	966	Datetime
32	8	2024-02-09T11:12:02+00:00	250	Datetime
33	8	2024-08-03T01:40:31+00:00	730	Float
34	12	2024-01-05T02:17:19+00:00	154	Date
35	72	2023-12-07T01:38:25+00:00	483	Boolean

36	32	2024-08-01T02:39:00+00:00	74	Date
37	50	2024-10-08T01:25:09+00:00	725	Datetime
38	47	2024-07-04T18:41:15+00:00	911	Blob
39	86	2024-08-21T09:37:45+00:00	650	JSON
40	33	2024-09-22T20:19:40+00:00	780	Blob
41	86	2024-04-02T11:23:02+00:00	869	Integer
42	36	2024-09-20T07:53:13+00:00	395	JSON
43	30	2023-12-05T20:38:14+00:00	862	Datetime
44	15	2024-04-29T05:28:45+00:00	71	Integer
45	60	2024-02-08T20:01:25+00:00	468	Integer
46	94	2023-12-07T23:15:49+00:00	249	Datetime
47	97	2023-12-21T20:31:55+00:00	77	Integer
48	2	2024-07-27T04:20:39+00:00	115	Boolean
49	21	2024-03-02T06:58:35+00:00	711	Integer
50	71	2024-05-09T19:11:44+00:00	310	Float
51	76	2024-04-26T09:02:42+00:00	497	Date
52	30	2024-09-17T17:45:44+00:00	461	Datetime
53	51	2024-09-17T09:12:44+00:00	855	Datetime
54	41	2024-03-19T08:46:37+00:00	323	Boolean
55	3	2024-02-25T02:53:03+00:00	854	Blob

56	10	2023-12-31T15:14:33+00:00	357	Date
57	46	2024-06-14T09:06:28+00:00	293	String
58	69	2024-05-13T18:22:37+00:00	142	JSON
59	100	2024-08-31T14:21:53+00:00	594	JSON
60	43	2024-10-16T03:44:16+00:00	508	JSON
61	52	2024-10-26T20:04:51+00:00	808	Integer
62	21	2023-12-19T11:58:25+00:00	933	JSON
63	11	2023-11-14T19:36:37+00:00	962	Date
64	31	2024-01-21T22:36:29+00:00	108	String
65	99	2024-03-23T21:02:53+00:00	14	Float
66	53	2024-07-24T05:52:24+00:00	200	JSON
67	64	2024-08-12T01:43:35+00:00	369	String
68	48	2024-02-24T22:35:45+00:00	703	Date
69	92	2024-05-10T22:37:37+00:00	755	Datetime
70	79	2024-04-04T08:26:27+00:00	293	Datetime
71	94	2023-11-18T19:24:49+00:00	500	Float
72	6	2024-06-26T23:13:23+00:00	400	Boolean
73	79	2023-12-14T01:44:22+00:00	25	Float
74	88	2024-04-24T19:51:11+00:00	629	Integer
75	63	2024-07-15T14:01:19+00:00	94	String

76	4	2024-11-07T10:03:52+00:00	456	String
77	13	2024-04-13T17:57:34+00:00	680	Float
78	12	2024-05-15T06:29:30+00:00	993	JSON
79	66	2023-12-17T06:31:31+00:00	426	Boolean
80	10	2024-02-27T18:34:57+00:00	512	Blob
81	5	2024-11-02T12:48:25+00:00	200	String
82	13	2024-05-19T12:59:30+00:00	102	Float
83	5	2024-06-27T08:33:38+00:00	300	JSON
84	55	2024-04-30T16:08:58+00:00	980	Integer
85	9	2024-10-10T06:54:15+00:00	524	Float
86	65	2024-06-05T02:11:17+00:00	630	JSON
87	13	2024-05-10T06:50:01+00:00	472	String
88	12	2024-09-19T02:25:13+00:00	917	Blob
89	82	2024-08-22T00:11:32+00:00	569	JSON
90	38	2024-04-21T23:36:21+00:00	499	Float
91	11	2024-10-17T15:29:17+00:00	859	Date
92	65	2023-11-28T18:57:36+00:00	782	Boolean
93	11	2024-08-23T19:08:41+00:00	449	JSON
94	28	2024-09-24T19:34:20+00:00	937	Boolean
95	9	2024-06-26T00:57:07+00:00	52	Boolean

96	73	2023-11-22T23:23:13+00:00	787	Datetime
97	90	2023-12-24T05:49:35+00:00	874	Float
98	51	2023-12-01T02:37:17+00:00	626	Date
99	46	2023-12-21T07:06:54+00:00	36	Date
100	45	2024-07-06T14:45:58+00:00	121	Boolean

10. Data_Analyst

Analyst_ID	Analyst_Name	Skills	Tools_Used	Projects_Analyzed	Start_Date
1	Giselle Mereweather	Python	SPSS	Image Recognition for Quality Control	2024-02-22T10:43:33+00:00
2	Rose Jakobssen	Critical Thinking	Tableau	Cybersecurity Threat Modeling	2024-09-14T11:13:16+00:00
3	Grover Lisamore	Machine Learning	Google Analytics	Personalization Engines Development	2024-04-05T08:41:40+00:00
4	Gregory Hall-Gough	Business Intelligence	SPSS	Customer Lifetime Value Prediction	2024-06-29T16:07:16+00:00
5	Skipper Winwright	Statistical Analysis	Jupyter Notebook	Supply Chain Optimization with Analytics	2024-01-20T20:34:25+00:00
6	Cara Neylan	Critical Thinking	Tableau	Machine Learning for Personalized Medicine	2024-09-20T13:54:19+00:00
7	Jermayne Linguard	Data Cleaning	SPSS	Sentiment Analysis on Social Media Data	2023-12-15T01:09:23+00:00
8	Ricki Roswarn	Presentation Skills	Power BI	Cybersecurity Threat Modeling	2024-09-12T21:09:39+00:00
9	Dre McCourt	Communication Skills	Tableau	Climate Data Modeling and Forecasting	2024-04-29T16:14:37+00:00
10	Cristen Tern	Project Management	Tableau	Remote Sensing Data Interpretation	2024-07-17T09:30:51+00:00
11	Cary Tumasian	Machine Learning	Jupyter Notebook	Deep Learning for Autonomous Vehicles	2024-10-04T08:15:42+00:00

12	Allister Dommersen	Critical Thinking	SAS	Machine Learning for Personalized Medicine	2024-10-27T09:26:32+00:00
13	Roobbie Moens	Data Wrangling	SPSS	Operational Efficiency through Data Integration	2024-04-09T00:58:39+00:00
14	Abra Dobey	Data Wrangling	R	Energy Consumption and Efficiency Analysis	2024-09-18T03:50:37+00:00
15	Amory Popham	Python	Python	Asset Management through Predictive Analysis	2024-06-01T04:43:46+00:00
16	Foster MacLardie	Presentation Skills	SAS	Personalization Engines Development	2024-06-05T03:48:29+00:00
17	Nicolina Writer	Machine Learning	Tableau	Personalization Engines Development	2024-02-26T07:12:56+00:00
18	Wit Huckabe	Machine Learning	SQL	Healthcare Cost Reduction Strategies	2024-07-21T22:43:34+00:00
19	Klarika Curl	Presentation Skills	R	Video Data Analytics for Retail Insights	2024-04-07T23:40:43+00:00
20	Amalita Hollows	Project Management	Power BI	Automated Dashboard Creation for Business Insights	2024-04-08T04:14:58+00:00
21	Gretna Steven	Problem Solving	Power BI	Machine Learning for Personalized Medicine	2024-07-14T14:53:35+00:00
22	Nikolos Dohr	Critical Thinking	Google Analytics	Energy Demand Forecasting and Management	2024-10-23T08:42:17+00:00
23	Emmery Eringey	Project Management	R	Energy Consumption and Efficiency Analysis	2024-08-05T05:55:43+00:00
24	Shaina Santo	Python	R	Data Visualization for Executive Reporting	2024-09-18T13:30:43+00:00
25	Angy Tomkies	Problem Solving	R	Credit Scoring Model Optimization	2024-11-02T10:47:31+00:00

26	Armand Maffey	Data Visualization	Google Analytics	Healthcare Cost Reduction Strategies	2024-02-29T14:41:30+00:00
27	Asa Usherwood	Presentation Skills	Excel	Supply Chain Optimization with Analytics	2024-08-21T10:32:18+00:00
28	Harmon Dudbridge	Machine Learning	Power BI	Product Recommendation System Implementation	2024-07-24T23:51:21+00:00
29	Deana Deniscke	SQL	R	Asset Management through Predictive Analysis	2024-04-09T18:58:14+00:00
30	Vivi Wantling	Presentation Skills	Excel	Data Visualization for Executive Reporting	2024-01-04T15:55:39+00:00
31	Mendy Grzelczyk	SQL	Jupyter Notebook	Risk Management with Big Data Analytics	2024-07-11T11:35:35+00:00
32	Leslie Struan	R	Python	Biometric Data Analysis for Security Systems	2024-01-17T16:24:45+00:00
33	Lynnet Ferneley	Presentation Skills	Jupyter Notebook	Customer Lifetime Value Prediction	2024-03-14T08:24:23+00:00
34	Sonya Howie	Problem Solving	SQL	Data Visualization for Executive Reporting	2024-07-21T16:52:17+00:00
35	Malinda Adshed	Data Cleaning	Jupyter Notebook	Healthcare Data Analysis for Patient Outcomes	2024-08-20T13:37:00+00:00
36	Ruprecht Coll	Data Wrangling	Jupyter Notebook	Energy Demand Forecasting and Management	2024-05-14T03:40:55+00:00
37	Lari Mertgen	Communication Skills	R	Product Recommendation System Implementation	2024-05-31T15:24:53+00:00
38	Oran McLugish	Python	Google Analytics	Deep Learning for Autonomous Vehicles	2024-09-30T13:12:12+00:00
39	Cristiano Reddy	Business Intelligence	Google Analytics	Energy Consumption and Efficiency Analysis	2024-02-16T02:41:32+00:00

40	Lexy Corn	Problem Solving	Python	Ad Campaign Performance Analysis	2024-06-29T09:13:00+00:00
41	Angie Delos	Problem Solving	Excel	Social Network Graph Analysis	2024-08-22T15:19:23+00:00
42	Rosemaria Haldenby	R	Tableau	Natural Language Processing for Customer Feedback	2024-08-24T08:26:09+00:00
43	Corrinne Archley	Project Management	Excel	Insurance Claim Prediction Models	2024-03-19T13:27:47+00:00
44	Giustina Scrange	R	R	Product Recommendation System Implementation	2024-11-02T09:17:14+00:00
45	Ax Henworth	Python	SPSS	Financial Risk Assessment and Analysis	2024-03-14T06:31:54+00:00
46	Barry Nelle	Project Management	Google Analytics	Remote Sensing Data Interpretation	2024-03-02T08:52:44+00:00
47	Agustin Kahan	Python	R	Remote Sensing Data Interpretation	2024-10-30T13:51:57+00:00
48	Genna Boriston	R	Python	Credit Scoring Model Optimization	2024-02-25T22:53:24+00:00
49	Konstance Cluff	Business Intelligence	Excel	Remote Sensing Data Interpretation	2024-03-29T22:12:44+00:00
50	Cathrin Ilyinski	Excel	SPSS	Logistics Efficiency Analysis	2024-06-21T13:25:05+00:00
51	Kimmie Hendrix	Data Wrangling	SPSS	HR Analytics for Employee Retention	2024-02-13T00:08:50+00:00
52	Tucker MacKeague	R	Python	Social Network Graph Analysis	2024-05-29T05:31:01+00:00
53	Eddy Edmead	Excel	Tableau	Social Network Graph Analysis	2024-03-11T17:21:19+00:00
54	Sena Noades	Communication Skills	SAS	Sales Forecasting Using Time Series	2024-02-03T04:34:34+00:00
55	Olympie Van den Dael	Data Visualization	Power BI	Natural Language Processing for Customer Feedback	2024-10-04T13:17:11+00:00
56	Renae Mallinar	Communication Skills	R	Stock Price Movement Predictions	2023-11-15T09:00:13+00:00

57	Ricky Starcks	Project Management	Power BI	Natural Language Processing for Customer Feedback	2024-10-05T21:46:25+00:00
58	Aylmer Pretley	SQL	R	Web Traffic Analysis and Reporting	2024-11-01T08:02:52+00:00
59	Peggie Herries	Communication Skills	SQL	Product Recommendation System Implementation	2024-01-07T17:11:09+00:00
60	Janet Pattison	Python	SAS	Cybersecurity Threat Modeling	2024-10-04T18:04:27+00:00
61	Lolly Gass	Business Intelligence	Tableau	Anomaly Detection in Transactional Data	2024-10-14T22:13:23+00:00
62	Gaspar Tremmil	Business Intelligence	SAS	Ad Campaign Performance Analysis	2024-03-03T23:04:06+00:00
63	Hogan Gregoletti	Data Visualization	SQL	Operational Efficiency through Data Integration	2024-06-18T20:47:32+00:00
64	Jarrid Milmith	Excel	Excel	Customer Segmentation Analysis	2024-06-22T06:54:39+00:00
65	Al Catcheside	Machine Learning	SAS	Natural Language Processing for Customer Feedback	2023-11-21T10:34:09+00:00
66	Anestassia Penna	Excel	Tableau	Cybersecurity Threat Modeling	2024-02-11T19:47:37+00:00
67	Dionis Eddington	SQL	Python	Asset Management through Predictive Analysis	2024-04-11T07:47:14+00:00
68	Mozes Gerlack	R	Excel	IoT Sensor Data Interpretation	2024-01-14T21:17:04+00:00
69	Giulio Steers	Critical Thinking	Power BI	Telecom Network Optimization Strategies	2024-03-14T15:21:34+00:00
70	Dorelle Seyler	Business Intelligence	Tableau	Automated Dashboard Creation for Business Insights	2024-09-11T03:20:37+00:00
71	Lemmy Backsal	R	Excel	E-Commerce Inventory Forecasting	2024-07-03T08:41:50+00:00

72	Caspar Turley	Data Wrangling	Power BI	HR Analytics for Employee Retention	2024-03-31T10:19:01+00:00
73	Rickard Lyons	Python	R	Insurance Claim Prediction Models	2024-06-05T03:01:30+00:00
74	Lazarus Stollery	Data Visualization	R	Product Recommendation System Implementation	2024-03-02T23:24:30+00:00
75	Eberhard Epinoy	Excel	Python	Traffic Data Analysis for Smart Cities	2023-11-10T14:50:01+00:00
76	Lester Elwel	Critical Thinking	Tableau	A/B Testing for E-commerce Platform	2024-02-10T11:20:21+00:00
77	Laurence Assel	Presentation Skills	Power BI	Voice Command Recognition Development	2024-09-11T08:19:43+00:00
78	Nanette Poynton	Critical Thinking	Python	Telecom Network Optimization Strategies	2024-07-20T23:44:59+00:00
79	Fidelity Porcher	Data Visualization	Tableau	Voice Command Recognition Development	2024-08-31T00:13:29+00:00
80	Cordi Varian	Machine Learning	SQL	Energy Demand Forecasting and Management	2023-11-24T09:15:27+00:00
81	Osbert McTurk	Problem Solving	Excel	Credit Scoring Model Optimization	2024-04-21T21:40:43+00:00
82	Thane Easman	Python	SPSS	Financial Risk Assessment and Analysis	2024-08-06T00:59:48+00:00
83	Trip Beevor	Data Wrangling	Power BI	Telecom Network Optimization Strategies	2024-05-22T11:49:49+00:00
84	Patrizia McGray	R	Excel	Churn Prediction Model Development	2024-03-07T11:04:32+00:00
85	Maynord Ellicock	Data Wrangling	Google Analytics	Web Traffic Analysis and Reporting	2024-05-27T14:37:14+00:00
86	Mayne Sirman	Statistical Analysis	R	Insurance Claim Prediction Models	2024-03-14T21:30:25+00:00
87	Alexandro Tapley	Problem Solving	R	Operational Efficiency through Data Integration	2024-06-10T04:52:39+00:00

88	Padraig Scole	Machine Learning	Excel	Personalization Engines Development	2023-12-18T10:23:53+00:00
89	Putnam Colquite	Problem Solving	SPSS	Predictive Maintenance for Manufacturing	2024-08-13T11:25:41+00:00
90	Reina Bewlay	Project Management	Jupyter Notebook	Energy Demand Forecasting and Management	2024-04-20T01:37:58+00:00
91	Cara Sammars	SQL	Google Analytics	Risk Management with Big Data Analytics	2024-08-12T08:26:00+00:00
92	Chrysler Dowles	Excel	SPSS	Product Recommendation System Implementation	2024-11-05T11:47:44+00:00
93	Madelon Braiden	Presentation Skills	R	Telecom Network Optimization Strategies	2024-01-04T18:39:52+00:00
94	Carolee Bodham	Project Management	R	Risk Management with Big Data Analytics	2024-07-31T17:25:07+00:00
95	Cammy Jeschner	Machine Learning	Excel	Operational Efficiency through Data Integration	2024-11-01T20:40:17+00:00
96	Agace Goaley	Data Visualization	Python	Market Basket Analysis for Retail	2024-04-21T23:18:06+00:00
97	Otto Worters	SQL	Jupyter Notebook	Fraud Detection System Enhancement	2023-11-25T08:53:33+00:00
98	Charita Kirwin	Excel	Google Analytics	Predictive Maintenance for Manufacturing	2024-01-11T03:14:18+00:00
99	Eugine Coates	Data Wrangling	Python	Consumer Behavior Trend Analysis	2024-01-23T18:35:27+00:00
100	Bearnard Dallinder	Data Wrangling	Jupyter Notebook	Risk Management with Big Data Analytics	2024-05-27T10:08:03+00:00

11. Environmental_Researcher

Researcher_ID	Researcher_Name	Field_of_Expertise	Institution_Affiliation	Publications	Active_Projects	Start_Date

1	Gard Hulance	Wildlife Management	Johns Hopkins University	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-07-23T14:36:18+00:00
2	Kris Passo	Marine Biology	California Institute of Technology	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-03-22T10:53:27+00:00
3	Cicely MacSherry	Waste Management	Yale University	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-04-22T17:44:43+00:00
4	Ninnetta Ebanks	Climate Science	California Institute of Technology	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-07-14T22:34:41+00:00
5	Claribel Pinson	Air Quality Management	Johns Hopkins University	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-06-04T11:50:41+00:00
6	Angelle Comoletti	Wildlife Management	University of California	Smith, J. (2020). Impacts of	Developing Sustainable	2024-07-24T16:11:59+00:

				Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Urban Air Quality Monitoring Systems	00
7	Yurik Pittem	Environmental Engineering	University of Oxford	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2023-11-21T20:09:35+00:00
8	Raimundo Corrett	Renewable Energy	Johns Hopkins University	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-04-21T21:21:56+00:00
9	Carlotta Daviot	Environmental Policy	University of California	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-02-28T19:46:31+00:00
10	Nathan Munroe	Soil Science	Yale University	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-05-21T23:00:17+00:00
11	Aurlie Tynemouth	Air Quality Management	University of British Columbia	Wang, H. & Patel, R. (2019). Renewable Energy	Optimization of Renewable Energy Grid Integration	2023-12-20T16:32:48+00:00

				Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.		
12	Ron Connikie	Sustainable Development	Stanford University	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-03-31T21:16:48+00:00
13	Everard Dally	Climate Science	Harvard University	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-01-01T00:53:50+00:00
14	Arri Wickens	Wildlife Management	California Institute of Technology	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-06-10T22:26:32+00:00
15	Rikki Heamus	Environmental Engineering	Massachusetts Institute of Technology	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-11-03T03:29:01+00:00
16	Michaela Gullis	Wildlife Management	University of Oxford	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems	Designing Urban Green Spaces for Enhanced Public Health	2023-11-14T08:30:30+00:00

				Approach. Landscape and Urban Planning, 202, 103898.		
17	Hyacinthe Valiant	Environmental Engineering	Massachusetts Institute of Technology	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-07-04T09:12:21+00:00
18	Ange Josskowitz	Biodiversity Conservation	University of Tokyo	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-04-26T02:45:51+00:00
19	Del Brankley	Ecology	University of California	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-08-13T07:52:02+00:00
20	Derek Thurlborn	Environmental Health	University of Cambridge	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-02-22T04:04:27+00:00
21	Britni Tunesi	Conservation Biology	Yale University	Lewis, P. (2018). Solar Energy Prospects in High-Priority	Balancing Solar Energy Development with	2024-04-27T02:43:18+00:00

				Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Conservation Needs	
22	Sarette Billings	Waste Management	University of Washington	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-01-02T10:15:54+00:00
23	Ari Haswall	Sustainable Development	University of British Columbia	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-01-24T13:50:17+00:00
24	Xever Elener	Climate Change Adaptation	Massachusetts Institute of Technology	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-08-03T06:02:28+00:00
25	Terrie Britnell	Water Resource Management	University of British Columbia	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2023-12-11T08:31:17+00:00
26	Bibi Bythway	Biodiversity Conservation	Harvard University	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-10-25T22:48:13+00:00

27	Dynah Kenelin	Conservation Biology	Stanford University	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-01-31T16:18:00+00:00
28	Elbert Leming	Biodiversity Conservation	University of Tokyo	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-02-16T17:28:00+00:00
29	Arnold Brunsen	Environmental Chemistry	Harvard University	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2023-11-29T22:42:19+00:00
30	Ettie Attenbrough	Sustainable Development	University of British Columbia	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-07-13T14:08:26+00:00
31	Dorothee Juszkiewicz	Environmental Policy	University of California	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies	Innovative Coastal Erosion Mitigation Techniques	2024-01-17T07:31:59+00:00

				Journal, 19(2), 213-229.		
32	Nahum Woollons	Conservation Biology	Johns Hopkins University	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-10-04T07:52:59+00:00
33	Leora Levermore	Soil Science	Massachusetts Institute of Technology	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2023-11-24T04:05:45+00:00
34	Lian Longforth	Conservation Biology	National University of Singapore	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-07-01T13:11:05+00:00
35	Basil Whitters	Renewable Energy	University of California	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-11-06T17:19:48+00:00
36	Meghan Kellough	Climate Change Adaptation	University of Cambridge	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in	Innovative Water Conservation Strategies for Arid Regions	2024-08-03T21:46:06+00:00

				Arid Regions. Journal of Water Resources, 55(7), 1003-1015.		
37	Emmaline Jotham	Waste Management	University of Tokyo	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-08-08T23:02:03+00:00
38	Junette Storrock	Waste Management	Harvard University	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-08-22T10:08:15+00:00
39	Carver Farnill	Biodiversity Conservation	University of Washington	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-01-20T04:26:55+00:00
40	Hercules Hogbourne	Climate Science	University of Washington	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2023-12-25T03:41:10+00:00
41	Bowie Johantges	Wildlife Management	University of Washington	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-04-09T13:49:44+00:00

42	Maria Johanssen	Environmental Health	Massachusetts Institute of Technology	Ramirez, C. et al. (2019). Advances in Wastewater Treatment Processes. Environmental Technology Journal, 40(5), 445-460.	Next-Generation Wastewater Treatment Solutions	2024-01-06T23:48:49+00:00
43	Georgeta Edgell	Environmental Chemistry	Stanford University	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-02-01T15:50:37+00:00
44	Craig Spat	Sustainable Development	Harvard University	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-05-14T01:39:06+00:00
45	Mame Palfreeman	Renewable Energy	Yale University	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-10-07T15:16:44+00:00

46	Gerianna Brimner	Waste Management	Massachusetts Institute of Technology	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-07-15T15:01:29+00:00
47	Arline Hanks	Climate Change Adaptation	Harvard University	Ramirez, C. et al. (2019). Advances in Wastewater Treatment Processes. Environmental Technology Journal, 40(5), 445-460.	Next-Generation Wastewater Treatment Solutions	2024-07-12T02:47:05+00:00
48	Brannon Roubottom	Conservation Biology	Imperial College London	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-07-08T00:12:41+00:00
49	Tremain Coo	Waste Management	National University of Singapore	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-08-02T14:15:46+00:00
50	Chrysler Winters	Biodiversity Conservation	Johns Hopkins University	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2023-11-12T10:23:34+00:00
51	Orsola McLaggan	Ecology	Johns Hopkins University	Baker, K. et al. (2020). The Role of Wetlands in Carbon	Enhancing Wetland Conservation for	2024-04-28T23:41:24+00:00

				Sequestration. Global Environmental Change, 57, 101934.	Climate Change Mitigation	
52	Lorenzo Huot	Climate Science	University of Cambridge	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2023-12-12T13:00:14+00:00
53	Germaine Trowsdale	Environmental Health	University of California	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-10-16T10:49:52+00:00
54	Joby Raithby	Sustainable Development	Imperial College London	Ramirez, C. et al. (2019). Advances in Wastewater Treatment Processes. Environmental Technology Journal, 40(5), 445-460.	Next-Generation Wastewater Treatment Solutions	2024-06-13T16:55:36+00:00
55	Garald Hinder	Environmental Chemistry	Stanford University	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-10-29T05:55:08+00:00
56	Norma Lapidus	Environmental Chemistry	University of Tokyo	Wang, H. & Patel, R. (2019). Renewable Energy	Optimization of Renewable Energy Grid Integration	2024-09-24T19:40:55+00:00

				Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.		
57	Arden Myatt	Conservation Biology	University of Oxford	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-08-29T08:49:50+00:00
58	Weber Gerardot	Soil Science	University of Tokyo	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-01-18T00:22:26+00:00
59	Erl Berceros	Wildlife Management	National University of Singapore	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-05-15T01:13:03+00:00
60	Natalina Janu	Renewable Energy	Peking University	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-07-13T00:03:48+00:00
61	Dwight Nissle	Renewable Energy	Massachusetts Institute of Technology	Lee, Y. & Chen, S. (2022). Microplastic	Reducing Microplastic	2024-10-09T20:24:25+00:00

				Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Pollution in Global Oceans	
62	Gerhardt MacCallum	Biodiversity Conservation	Imperial College London	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-03-04T19:28:37+00:00
63	Arnuad Alldritt	Soil Science	Johns Hopkins University	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-01-30T03:49:17+00:00
64	Deny Ikins	Waste Management	National University of Singapore	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-07-14T04:47:11+00:00
65	Gray Gittoes	Environmental Chemistry	University of British Columbia	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-09-07T15:07:52+00:00
66	Robyn Beet	Climate Change Adaptation	Harvard University	Smith, J. (2020). Impacts of Urbanization on Local Air Quality.	Developing Sustainable Urban Air Quality	2023-12-02T05:27:01+00:00

				Environmental Science Journal, 25(3), 341-351.	Monitoring Systems	
67	Roby Lett	Ecology	Johns Hopkins University	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2023-11-16T18:12:34+00:00
68	Rosalind Follacaro	Conservation Biology	Peking University	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-10-30T13:04:02+00:00
69	Andy Olkowicz	Climate Change Adaptation	University of Washington	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-11-06T08:44:30+00:00
70	Wernher Siverns	Environmental Health	University of California	Lopez, A. & Kim, H. (2021). Urban Green Spaces and Human Well-being: A Systems Approach. Landscape and Urban Planning, 202, 103898.	Designing Urban Green Spaces for Enhanced Public Health	2024-01-16T15:20:06+00:00
71	Corny Murden	Climate Change Adaptation	University of California	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional	Optimization of Renewable Energy Grid Integration	2024-07-02T00:37:56+00:00

				Power Grids. Journal of Renewable Energy, 11(4), 455-468.		
72	Colin Ceeley	Wildlife Management	University of Tokyo	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-04-17T14:14:51+00:00
73	Candis Jentzsch	Environmental Policy	University of Tokyo	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-08-23T04:13:53+00:00
74	Humfrid Cosgry	Wildlife Management	Massachusetts Institute of Technology	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-04-14T19:32:38+00:00
75	Earvin Aland	Permaculture	University of Cambridge	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-08-31T14:35:47+00:00
76	Dame Matzel	Ecology	Yale University	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of	Balancing Solar Energy Development with Conservation Needs	2024-01-29T23:26:43+00:00

				Solar Energy Engineering, 42(3), 645-654.		
77	Zulema Waymont	Environmental Engineering	University of Washington	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-07-27T04:04:54+00:00
78	Mahalia Rassmann	Permaculture	Yale University	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-04-04T23:52:03+00:00
79	Ferd Pettifor	Ecology	Peking University	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-05-30T08:38:50+00:00
80	Kermit Peret	Water Resource Management	University of Oxford	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-03-22T03:47:53+00:00
81	Germana Bartoli	Environmental Engineering	Harvard University	Ramirez, C. et al. (2019). Advances in Wastewater Treatment Processes.	Next-Generation Wastewater Treatment Solutions	2024-04-20T17:36:54+00:00

				Environmental Technology Journal, 40(5), 445-460.		
82	Ora Curtin	Wildlife Management	Johns Hopkins University	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-10-17T23:21:49+00:00
83	Waylon Finnick	Environmental Policy	Yale University	Lee, Y. & Chen, S. (2022). Microplastic Pollution in Marine Environments: A Global Overview. Marine Pollution Bulletin, 156, 111234.	Reducing Microplastic Pollution in Global Oceans	2024-05-20T07:43:29+00:00
84	Law Tivers	Environmental Policy	University of Oxford	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-05-15T05:06:38+00:00
85	Kristofer Husthwaite	Climate Science	University of Cambridge	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2024-06-19T19:48:27+00:00
86	Allayne Hendriksen	Marine Biology	California Institute of Technology	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2023-11-26T11:18:26+00:00

87	Guenevere Van den Dael	Environmental Policy	Yale University	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-05-03T17:07:20+00:00
88	Livia Licas	Environmental Policy	University of Tokyo	Wang, H. & Patel, R. (2019). Renewable Energy Integration in Traditional Power Grids. Journal of Renewable Energy, 11(4), 455-468.	Optimization of Renewable Energy Grid Integration	2024-08-08T10:16:33+00:00
89	Humphrey Clacey	Water Resource Management	Imperial College London	Lewis, P. (2018). Solar Energy Prospects in High-Priority Conservation Areas. Journal of Solar Energy Engineering, 42(3), 645-654.	Balancing Solar Energy Development with Conservation Needs	2024-04-05T12:20:29+00:00
90	Clemmie Sutty	Waste Management	Imperial College London	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-07-20T22:22:07+00:00
91	Torrey Hucke	Marine Biology	University of Cambridge	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies	Innovative Coastal Erosion Mitigation Techniques	2024-02-14T12:02:57+00:00

				Journal, 19(2), 213-229.		
92	Sigismundo Chastenet	Environmental Chemistry	University of California	Smith, J. (2020). Impacts of Urbanization on Local Air Quality. Environmental Science Journal, 25(3), 341-351.	Developing Sustainable Urban Air Quality Monitoring Systems	2024-08-20T20:48:03+00:00
93	Kati Redgrave	Environmental Engineering	Imperial College London	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-03-23T10:46:43+00:00
94	Nigel Kennsley	Renewable Energy	Imperial College London	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-07-09T15:03:52+00:00
95	Austin Jeanin	Environmental Policy	University of Washington	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-09-30T11:28:38+00:00
96	Cullie McTear	Environmental Engineering	Yale University	Baker, K. et al. (2020). The Role of Wetlands in Carbon Sequestration. Global Environmental Change, 57, 101934.	Enhancing Wetland Conservation for Climate Change Mitigation	2023-12-19T17:46:56+00:00

97	Adi Rohloff	Environmental Chemistry	Johns Hopkins University	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2023-12-04T04:06:19+00:00
98	Nevile Blaik	Permaculture	University of Washington	Garcia, F. (2018). Biodiversity Loss in Agricultural Landscapes: Evaluating New Strategies. Journal of Ecology, 30(1), 12-25.	Reviving Biodiversity in Farmlands through Ecological Design	2024-07-22T09:47:10+00:00
99	Marylynne Taberner	Ecology	California Institute of Technology	Harper, D. & Nguyen, T. (2023). Water Conservation Techniques in Arid Regions. Journal of Water Resources, 55(7), 1003-1015.	Innovative Water Conservation Strategies for Arid Regions	2024-07-27T16:38:42+00:00
100	Swen Quince	Air Quality Management	National University of Singapore	Johnson, L. et al. (2021). Climate Change and Coastal Erosion: Addressing Future Challenges. Coastal Studies Journal, 19(2), 213-229.	Innovative Coastal Erosion Mitigation Techniques	2024-02-08T12:25:38+00:00

12. Greenhouse

Greenhouse_ID	Location	Size	Crop_Type	Status	Owner_ID
1	10019 Ultra Court, Rochester, New York, United States, 14609	668	Spinach	Reopened	92
2	13747 Mallory Hill Drive, Salt Lake City, Utah, United States, 84105	916	Cucumber	Successful	15
3	2157 Smithfield Place, San Jose, California, United States, 95150	144	Basil	In Progress	52
4	7762 Oak Meadows Lane, Monticello, Minnesota, United States, 55590	517	Bell Pepper	Cancelled	10
5	5374 Dewitt Circle, Des Moines, Iowa, United States, 50981	358	Cucumber	In Progress	58
6	1371 Trellis Lane, Modesto, California, United States, 95354	92	Chili Pepper	Closed	13
7	8649 Heiny Place, Raleigh, North Carolina, United States, 27658	577	Zucchini	On Hold	63
8	1898 Fiddlewood Place, San Diego, California, United States, 92132	127	Strawberry	Successful	29
9	9341 Denicola Drive, Sparks, Nevada, United States, 89436	623	Basil	On Hold	39
10	4233 Bunker Lane, Orlando, Florida,	282	Chili Pepper	Cancelled	85

	United States, 32803				
11	5742 Lamington Lane, Peoria, Illinois, United States, 61635	383	Bell Pepper	In Progress	49
12	12625 Van Buren Way, Denton, Texas, United States, 76205	841	Chili Pepper	Reopened	41
13	7272 Twinkle Circle, Silver Spring, Maryland, United States, 20904	485	Strawberry	Reopened	57
14	13324 Indianwood Road, Huntsville, Texas, United States, 77343	888	Lettuce	Reopened	17
15	1029 Noble Way, Fresno, California, United States, 93786	69	Lettuce	On Hold	67
16	6032 Trevino Terrace, Indianapolis, Indiana, United States, 46216	402	Strawberry	On Hold	68
17	8424 Corona Avenue, Charlotte, North Carolina, United States, 28242	562	Eggplant	Closed	39
18	2487 Emory Avenue, Colorado Springs, Colorado, United States, 80905	166	Spinach	Failed	100
19	9577 Alcove Loop, Buffalo, New York, United States, 14220	638	Lettuce	Closed	43
20	5372 Live Oak Avenue, Des Moines, Iowa, United States, 50981	358	Strawberry	On Hold	27

21	9936 Calgary Street, New York City, New York, United States, 10184	662	Tomato	Successful	100
22	10056 Balmoral Lane, Rochester, New York, United States, 14646	670	Tomato	In Progress	78
23	5748 Haskins Court, Peoria, Illinois, United States, 61640	383	Lettuce	On Hold	98
24	14959 Garza Place, Topeka, Kansas, United States, 66699	997	Bell Pepper	On Hold	98
25	6316 Koller Court, Jacksonville, Florida, United States, 32277	421	Cucumber	Open	23
26	3910 Hardeeville Court, Charleston, West Virginia, United States, 25321	261	Spinach	Open	27
27	14868 Pendleton Circle, Columbia, South Carolina, United States, 29203	991	Lettuce	In Progress	41
28	11640 Harold Place, Tacoma, Washington, United States, 98464	776	Zucchini	Successful	73
29	14599 Biller Circle, Washington, District of Columbia, United States, 20530	973	Cucumber	Closed	91
30	14639 Blackwell Lane, Melbourne, Florida, United States, 32919	976	Strawberry	Failed	19
31	3361 Umatilla Way, Indianapolis,	224	Lettuce	Reopened	42

	Indiana, United States, 46266				
32	3989 Eleanor Lane, Gastonia, North Carolina, United States, 28055	266	Basil	In Progress	3
33	6090 Duxbury Lane, Tulsa, Oklahoma, United States, 74116	406	Tomato	On Hold	23
34	8533 Bowles Place, San Antonio, Texas, United States, 78235	569	Basil	Successful	33
35	10891 Las Pacos Court, Littleton, Colorado, United States, 80127	726	Chili Pepper	Closed	58
36	13539 Brighton Drive, Fort Lauderdale, Florida, United States, 33345	902	Eggplant	Successful	91
37	2741 Caledonia Terrace, Springfield, Illinois, United States, 62756	183	Strawberry	Cancelled	26
38	3720 Wekiva Street, Terre Haute, Indiana, United States, 47812	248	Strawberry	Open	48
39	5828 Yellowstone Court, Montgomery, Alabama, United States, 36177	389	Strawberry	In Progress	68
40	6175 El Esparza Lane, Little Rock, Arkansas, United States, 72231	412	Spinach	Cancelled	41
41	351 Kingstree Place, Washington, District of Columbia, United States, 20530	24	Tomato	On Hold	89
42	439 Dogwood Street, Atlanta,	30	Strawberry	Reopened	27

	Georgia, United States, 30380				
43	3361 Gerry Andrews Place, San Francisco, California, United States, 94159	224	Lettuce	On Hold	90
44	4903 Avalos Drive, San Antonio, Texas, United States, 78255	327	Spinach	Successful	56
45	2071 Osborne Street, Homestead, Florida, United States, 33034	138	Zucchini	Open	19
46	8572 Bernhagen Road, Amarillo, Texas, United States, 79171	571	Strawberry	On Hold	53
47	13571 Mcsweeney Avenue, Baltimore, Maryland, United States, 21229	904	Lettuce	Successful	61
48	3828 Wightman Circle, Paterson, New Jersey, United States, 07522	255	Bell Pepper	Failed	75
49	12126 Winifred Way, Schenectady, New York, United States, 12325	808	Basil	Cancelled	43
50	7145 Endsley Court, San Francisco, California, United States, 94177	476	Spinach	Reopened	68
51	8979 Avenida Central, Indianapolis, Indiana, United States, 46266	599	Eggplant	Closed	43
52	10091 Forsyth Street, Houston, Texas, United States, 77234	673	Chili Pepper	Open	46
53	2092 Abel Place, Lake Worth, Florida,	140	Tomato	Failed	93

	United States, 33462				
54	6087 Incorvaia Way, Laredo, Texas, United States, 78044	406	Lettuce	Successful	4
55	13211 Bonneau Lane, Jackson, Mississippi, United States, 39236	880	Spinach	In Progress	43
56	3930 Apalachee Avenue, Carlsbad, California, United States, 92013	262	Chili Pepper	Reopened	70
57	13362 Hillside Lane, Grand Junction, Colorado, United States, 81505	890	Cucumber	In Progress	21
58	8282 Inman Mills Road, Columbia, Missouri, United States, 65211	552	Strawberry	On Hold	92
59	892 Swainwood Court, Trenton, New Jersey, United States, 08695	60	Lettuce	Open	86
60	2712 Blackwell Lane, Erie, Pennsylvania, United States, 16505	181	Tomato	In Progress	8
61	7903 Judge Place, Wichita, Kansas, United States, 67230	527	Bell Pepper	Open	80
62	9035 Burton Lane, Syracuse, New York, United States, 13205	602	Chili Pepper	Closed	45
63	11106 Ridley Terrace, Wichita, Kansas, United States, 67220	740	Tomato	Closed	33
64	6359 Athens Lane, New Orleans,	424	Bell Pepper	Open	53

	Louisiana, United States, 70154				
65	10110 Blackton Avenue, Arlington, Virginia, United States, 22212	674	Tomato	Cancelled	95
66	6352 Williams Road, Gilbert, Arizona, United States, 85297	424	Lettuce	Failed	71
67	6777 Eastpoint Street, Wichita, Kansas, United States, 67230	452	Strawberry	Closed	67
68	13896 Haynesville Way, Cleveland, Ohio, United States, 44118	926	Basil	In Progress	28
69	478 Johnston Path, Ogden, Utah, United States, 84403	32	Cucumber	Failed	3
70	6362 Pepperidge Circle, El Paso, Texas, United States, 88558	424	Zucchini	Closed	22
71	10398 Kennedy Avenue, Knoxville, Tennessee, United States, 37939	693	Cucumber	Open	80
72	3002 Martin Lane, Lake Charles, Louisiana, United States, 70616	200	Lettuce	Cancelled	91
73	13720 Mazzio Lane, Fort Myers, Florida, United States, 33913	914	Tomato	Open	17
74	12837 Painter-Smith Lane, Atlanta, Georgia, United States, 30358	855	Basil	On Hold	64

75	1129 Calzada Court, Saint Paul, Minnesota, United States, 55146	76	Bell Pepper	Successful	14
76	11874 Pisano Way, Reston, Virginia, United States, 22096	791	Tomato	On Hold	44
77	6684 Wise Way, Columbus, Ohio, United States, 43240	446	Strawberry	Open	7
78	3743 Sawgrass Court, Winston Salem, North Carolina, United States, 27105	250	Strawberry	Failed	32
79	4880 Hollis Way, Miami, Florida, United States, 33164	326	Spinach	On Hold	62
80	7832 Bowles Place, Tuscaloosa, Alabama, United States, 35405	522	Zucchini	Cancelled	31
81	14127 Mulligan Run, Washington, District of Columbia, United States, 20380	941	Bell Pepper	Cancelled	37
82	10507 Wayland Street, Memphis, Tennessee, United States, 38161	700	Tomato	Reopened	70
83	9924 Sherman Street, San Antonio, Texas, United States, 78240	661	Basil	On Hold	30
84	8681 Karen Perkins Street, Boulder, Colorado, United States, 80305	579	Chili Pepper	Closed	2
85	4069 Smithfield Place, Brooklyn, New York, United States, 11254	271	Basil	On Hold	25

86	362 Rayma Place, San Francisco, California, United States, 94116	25	Chili Pepper	Reopened	46
87	3223 Bennett Place, Lexington, Kentucky, United States, 40591	215	Strawberry	On Hold	56
88	11960 Oleander Street, Washington, District of Columbia, United States, 20425	797	Strawberry	Cancelled	12
89	13549 James Gray Street, Chula Vista, California, United States, 91913	903	Basil	In Progress	77
90	2463 Berwick Terrace, Denver, Colorado, United States, 80299	164	Eggplant	Open	29
91	9545 Marion Court, Vero Beach, Florida, United States, 32969	636	Cucumber	On Hold	83
92	2007 Daffodil Court, Henderson, Nevada, United States, 89074	134	Tomato	On Hold	16
93	6456 Ranchwood Terrace, Burbank, California, United States, 91520	430	Strawberry	Failed	78
94	3277 Cormorant Terrace, Sarasota, Florida, United States, 34276	219	Strawberry	On Hold	26
95	909 Asher Path, Idaho Falls, Idaho, United States, 83405	61	Strawberry	In Progress	2
96	2681 Stebbins Lane, Chicago, Illinois, United States, 60604	179	Cucumber	On Hold	51

97	4696 Fieldstone Path, Cincinnati, Ohio, United States, 45999	313	Cucumber	In Progress	7
98	9162 Ashland Avenue, Pompano Beach, Florida, United States, 33069	611	Cucumber	In Progress	10
99	887 De Lancy Lane, Huntsville, Alabama, United States, 35805	60	Strawberry	On Hold	3
100	4531 Orwell Street, Springfield, Massachusetts, United States, 01152	302	Spinach	Failed	41

13. Greenhouse_Operator

Operator_ID	Name	Greenhouse_Location	Greenhouse_Size	Crop_Type	Technology_Used	Operation_Start_Date
1	Querida Riddel	7387 Kauska Way, Detroit, Michigan, United States, 48267	4975	Green Beans	Smartglass technology	2024-05-07T21:00:45+00:00
2	Koenraad Massie	2579 El Nino Street, Denver, Colorado, United States, 80204	1801	Herbs	Greenhouse automation	2024-01-11T12:54:23+00:00
3	Carlye Franklen	12064 Carlsbad Court, Nashville, Tennessee, United States, 37245	8062	Eggplant	LED grow lights	2024-08-29T23:57:41+00:00
4	Ernest Rumney	11608 Quaint Court, Charleston, South Carolina, United	7761	Herbs	Greenhouse automation	2024-08-18T21:06:22+00:00

		States, 29403				
5	Byram Feaveer	4393 Derringer Avenue, Pensacola, Florida, United States, 32590	2999	Cucumber	Aeroponics	2024-02-24T19:27:57+00:00
6	Gaile Crewdson	7082 Pope Place, Worcester, Massachusetts, United States, 01605	4773	Spinach	Bioponics	2024-04-30T10:03:02+00:00
7	Kikelia Habert	11612 Gaylark Avenue, Charleston, South Carolina, United States, 29403	7763	Lettuce	Aquaponics	2024-08-18T23:08:48+00:00
8	Leoine Praundlin	8407 Countrywind Court, Charlotte, North Carolina, United States, 28230	5648	Spinach	Bioponics	2024-06-01T18:34:12+00:00
9	Kristina Scrivens	9019 Guy Terrace, Trenton, New Jersey, United States, 08638	6052	Lettuce	Aquaponics	2024-05-25T07:01:45+00:00

10	Lawry Huntly	8101 Rutledge Street, Saint Louis, Missouri, United States, 63131	5446	Bell Pepper	Soil-based cultivation	2024-01-08T10:10:03+00:00
11	Petrina Inglesent	2451 Conley Court, Aurora, Colorado, United States, 80044	1717	Cucumber	Aeroponics	2024-04-28T03:14:27+00:00
12	Marietta Leeves	6988 Cadena Circle, Lynn, Massachusetts, United States, 01905	4712	Lettuce	Aquaponics	2024-01-07T03:32:32+00:00
13	Calypso Micklewright	2399 Rios Court, Ventura, California, United States, 93005	1682	Lettuce	Aquaponics	2024-07-26T17:03:52+00:00
14	Remus Mountlow	10659 Rowesville Lane, Toledo, Ohio, United States, 43615	7134	Bell Pepper	Soil-based cultivation	2024-03-12T06:50:45+00:00
15	Virgilio Rottgers	5068 Queen Palm Place, Lawrenceville, Georgia,	3444	Spinach	Bioponics	2024-07-20T06:56:24+00:00

		United States, 30045				
16	Breena Elvins	10396 Love Avenue, Cleveland, Ohio, United States, 44111	6961	Green Beans	Smartglass technology	2024-08-07T21:45:45+00:00
17	Clerissa Lindeman	11159 Picasso Place, Harrisburg, Pennsylvania, United States, 17110	7464	Lettuce	Aquaponics	2024-06-11T09:16:51+00:00
18	Rupert Jindracek	8801 Powhite Place, Omaha, Nebraska, United States, 68105	5908	Bell Pepper	Soil-based cultivation	2024-03-01T10:23:28+00:00
19	Stanwood Tootal	4623 Alcona Avenue, Tampa, Florida, United States, 33625	3151	Herbs	Greenhouse automation	2024-08-26T16:13:46+00:00
20	Alexandrina Polson	11928 Sothell Street, Memphis, Tennessee, United States, 38131	7972	Strawberry	Vertical farming	2024-10-03T15:28:14+00:00
21	Aguste Wingham	13484 Bethune Way, San	8999	Lettuce	Aquaponics	2024-02-11T20:54:20+00:00

		Angelo, Texas, United States, 76905				
22	Kelwin Adds	3863 Redwood Road, Jacksonville, Florida, United States, 32220	2649	Zucchini	Renewable energy sources	2024-06-14T07:17:48+00:00
23	Phedra Capozzi	8921 Mareno Court, Jersey City, New Jersey, United States, 07310	5987	Cucumber	Aeroponics	2024-01-03T11:06:10+00:00
24	Nollie Yanne	2248 Beadle Place, Santa Barbara, California, United States, 93111	1583	Spinach	Bioponics	2024-03-04T02:30:44+00:00
25	Lorrin Garvill	4733 Ormond Court, Winter Haven, Florida, United States, 33884	3223	Bell Pepper	Soil-based cultivation	2024-09-21T11:56:52+00:00
26	Constantino Blaksland	12986 Ridgeville Road, Garland, Texas, United States, 75044	8671	Cucumber	Aeroponics	2024-10-02T05:33:53+00:00

27	Bank Parks	13426 Bugala Lane, Midland, Texas, United States, 79705	8961	Green Beans	Smartglass technology	2024-07-19T09:12:45+00:00
28	Demetri Oldnall	10359 Edgeworth Terrace, Cincinnati, Ohio, United States, 45271	6936	Lettuce	Aquaponics	2024-03-20T23:35:06+00:00
29	Mag Ruddy	5424 Bamberg Avenue, Boise, Idaho, United States, 83711	3680	Zucchini	Renewable energy sources	2024-01-24T07:27:36+00:00
30	Ernst Cail	3102 Oak Bend Place, Washington, District of Columbia, United States, 20205	2147	Strawberry	Vertical farming	2024-08-04T18:26:28+00:00
31	Ray Colenutt	11030 Asher Path, Portland, Oregon, United States, 97255	7379	Eggplant	LED grow lights	2024-03-11T12:14:41+00:00
32	Lucinda Chainey	12594 Darwin Terrace, Dallas, Texas,	8412	Cucumber	Aeroponics	2024-01-28T10:58:53+00:00

		United States, 75379				
33	Talyah Millberg	5036 Ava Street, Decatur, Georgia, United States, 30089	3423	Strawberry	Vertical farming	2024-05-31T10:10:55+00:00
34	Lorant Slessor	3272 Barbosa Court, Washington, District of Columbia, United States, 20420	2259	Herbs	Greenhouse automation	2024-04-06T09:44:39+00:00
35	Gabrielle Ioannou	8352 Rembert Road, Asheville, North Carolina, United States, 28805	5612	Bell Pepper	Soil-based cultivation	2024-03-20T21:45:51+00:00
36	Wallache Merriton	6097 Bedford Way, Indianapolis, Indiana, United States, 46278	4124	Herbs	Greenhouse automation	2024-10-08T09:42:51+00:00
37	Ronald Bau	5421 Joseph Way, Boise, Idaho, United States, 83711	3677	Bell Pepper	Soil-based cultivation	2023-12-19T05:48:54+00:00

38	Antonella Lammie	13679 Banning Court, Waco, Texas, United States, 76705	9128	Eggplant	LED grow lights	2024-06-14T00:22:47+00:00
39	Norene Conlaund	1624 Fairchild Lane, Richmond, California, United States, 94807	1171	Spinach	Bioponics	2024-08-07T17:59:58+00:00
40	Jo ann Mattsson	8909 Tupelo Terrace, Jersey City, New Jersey, United States, 07305	5980	Cucumber	Aeroponics	2024-01-19T15:52:59+00:00
41	Iorgo Daughtrey	11152 Avenida Central, Harrisburg, Pennsylvania, United States, 17105	7460	Eggplant	LED grow lights	2024-01-30T10:18:00+00:00
42	Golda Fere	2911 Merryweather Way, Norwalk, Connecticut, United States, 06859	2021	Spinach	Bioponics	2024-01-02T21:05:23+00:00
43	Adrienne Dommerque	3353 Travis Place,	2312	Eggplant	LED grow lights	2024-06-05T09:51:49+00:00

		Washington, District of Columbia, United States, 20525				
44	Bernardo Couldwell	2224 Ithaca Terrace, Santa Ana, California, United States, 92705	1567	Eggplant	LED grow lights	2024-09-03T15:07:12+00:00
45	Denys Butterworth	8557 Denison Place, Greensboro, North Carolina, United States, 27415	5747	Eggplant	LED grow lights	2024-03-16T19:32:37+00:00
46	Crissie Greschke	12254 Banning Court, Cedar Rapids, Iowa, United States, 52405	8187	Zucchini	Renewable energy sources	2024-03-31T19:56:28+00:00
47	Gene Bercher	5254 Silk Tree Terrace, Bloomington, Indiana, United States, 47405	3567	Zucchini	Renewable energy sources	2024-10-24T16:28:55+00:00
48	Bourke Nilges	5869 Buck Street, Vienna, Virginia,	3973	Cucumber	Aeroponics	2024-06-06T19:43:46+00:00

		United States, 22184				
49	Ag Sparshutt	14346 Alcazar Court, Raleigh, North Carolina, United States, 27615	9568	Strawberry	Vertical farming	2024-04-23T11:32:30+00:00
50	Marcille Whittaker	8614 Quasar Avenue, New Orleans, Louisiana, United States, 70174	5785	Cucumber	Aeroponics	2024-05-01T16:52:24+00:00
51	Inger Caldroni	6797 Elkington Road, Baltimore, Maryland, United States, 21216	4586	Spinach	Bioponics	2024-06-20T10:35:27+00:00
52	Ingamar Flipsen	7134 Machol Street, Van Nuys, California, United States, 91406	4808	Eggplant	LED grow lights	2024-08-26T02:33:13+00:00
53	Easter Corris	9172 Barbosa Court, Memphis, Tennessee, United States, 38114	6153	Eggplant	LED grow lights	2024-04-26T10:59:53+00:00

54	Libby Benard	2373 Lime Grove Lane, Boston, Massachusetts, United States, 02163	1666	Bell Pepper	Soil-based cultivation	2024-02-18T20:44:20+00:00
55	Kevan Cawthry	11904 Krilov Place, Miami, Florida, United States, 33283	7957	Herbs	Greenhouse automation	2024-05-15T04:36:42+00:00
56	Joe Clawley	6919 Guillermina Loop, Minneapolis, Minnesota, United States, 55436	4666	Lettuce	Aquaponics	2024-01-22T22:21:06+00:00
57	Oriana Corthes	4149 Grimball Avenue, Washington, District of Columbia, United States, 20057	2838	Herbs	Greenhouse automation	2024-07-11T23:11:20+00:00
58	Vikky Gouch	7687 Randi Road, Rochester, New York, United States, 14646	5173	Green Beans	Smartglass technology	2024-05-27T03:12:53+00:00
59	Nicoline Fleay	3045 Aber Lane,	2109	Lettuce	Aquaponics	2024-01-26T11:36:23+00:00

		Saint Louis, Missouri, United States, 63169				
60	Therine Crowd	10055 Coffman Loop, Washington, District of Columbia, United States, 20310	6736	Green Beans	Smartglass technology	2024-06-17T17:57:07+00:00
61	Niven Cregeen	8176 Duncan Drive, Albuquerque, New Mexico, United States, 87121	5496	Spinach	Bioponics	2024-04-01T21:31:59+00:00
62	Ricca Banck	3191 Berwyn Way, Evansville, Indiana, United States, 47725	2205	Zucchini	Renewable energy sources	2024-05-06T14:20:59+00:00
63	Lolly Gregoretti	9062 Fairchild Lane, Detroit, Michigan, United States, 48211	6081	Spinach	Bioponics	2024-07-28T07:38:58+00:00
64	Aloise Bruyett	5913 Cherokee Court, Youngstown, Ohio, United	4002	Spinach	Bioponics	2024-01-02T20:22:16+00:00

		States, 44555				
65	Starlin Peperell	7335 Dumas Street, Santa Ana, California, United States, 92705	4940	Green Beans	Smartglass technology	2024-06-30T22:13:16+00:00
66	Brock Hinkens	10725 Yellowstone Court, Buffalo, New York, United States, 14263	7178	Tomato	Hydroponics	2024-08-01T13:52:25+00:00
67	Dulce O' Kelleher	2222 Catalani Lane, Tulsa, Oklahoma, United States, 74126	1566	Spinach	Bioponics	2024-01-21T02:44:54+00:00
68	Ogden Trewhella	9602 Ola Terrace, Washington, District of Columbia, United States, 20005	6437	Strawberry	Vertical farming	2024-06-24T08:35:29+00:00
69	Felix Kilshall	10899 Granada Court, Reno, Nevada, United States, 89595	7293	Green Beans	Smartglass technology	2024-08-19T09:11:15+00:00
70	Sandro Teaze	2971 Morse Boulevard,	2060	Spinach	Bioponics	2024-07-06T06:41:42+00:00

		Charleston, South Carolina, United States, 29416				
71	Carleton Yurkin	9333 Canales Lane, New York City, New York, United States, 10090	6259	Tomato	Hydroponics	2024-02-23T16:08:58+00:00
72	Rafaello MacCook	11629 Ramsell Road, Greensboro, North Carolina, United States, 27499	7775	Bell Pepper	Soil-based cultivation	2024-06-06T02:34:57+00:00
73	Carey Oliffe	9822 Wayside Place, Brooklyn, New York, United States, 11220	6582	Eggplant	LED grow lights	2024-06-28T09:48:03+00:00
74	Bamby Espinas	4346 Pompion Street, Richmond, Virginia, United States, 23272	2968	Spinach	Bioponics	2024-10-21T11:52:29+00:00
75	Paulina Hallet	8585 Golf Lane, Knoxville, Tennessee, United	5766	Herbs	Greenhouse automation	2024-08-24T12:50:06+00:00

		States, 37914				
76	Theodoric Latan	9499 Pelchat Place, San Antonio, Texas, United States, 78250	6369	Tomato	Hydroponics	2024-10-05T12:58:18+00:00
77	Mervin Stears	14215 Swallow Court, San Diego, California, United States, 92127	9482	Green Beans	Smartglass technology	2023-12-25T17:37:29+00:00
78	Abbie Lethieulier	11840 San Jose Place, San Francisco, California, United States, 94116	7914	Cucumber	Aeroponics	2024-04-22T01:30:15+00:00
79	Darb Eymor	13562 Joshua Court, Harrisburg, Pennsylvania, United States, 17140	9050	Cucumber	Aeroponics	2024-08-08T14:57:47+00:00
80	Lia Mottershaw	1890 Nellie Road, Port Charlotte, Florida, United States, 33954	1347	Green Beans	Smartglass technology	2024-02-25T23:12:04+00:00

81	Livvie Lembke	6739 Melville Loop, New York City, New York, United States, 10125	4547	Zucchini	Renewable energy sources	2024-07-07T13:51:52+00:00
82	Gearalt Ropert	2008 San Luis Lane, Albuquerque, New Mexico, United States, 87121	1425	Tomato	Hydroponics	2023-12-06T04:27:21+00:00
83	Rorke McCrillis	11188 Outridge Loop, Washington, District of Columbia, United States, 20319	7484	Eggplant	LED grow lights	2024-01-26T14:09:57+00:00
84	Noah MacCallion	4440 Monroe Terrace, Missoula, Montana, United States, 59806	3030	Spinach	Bioponics	2024-05-31T05:33:36+00:00
85	Bibbye Thomelin	9875 Estill Avenue, Lawrenceville, Georgia, United States, 30245	6617	Lettuce	Aquaponics	2024-03-12T11:56:26+00:00
86	Robby Farebrother	9062 Ricardo Avenue, Charlotte	6081	Tomato	Hydroponics	2024-06-02T15:00:55+00:00

		, North Carolina, United States, 28256				
87	Marnia Rentenbeck	1089 Bancroft Place, Saint Cloud, Minnesota, United States, 56372	818	Bell Pepper	Soil-based cultivation	2024-05-17T08:48:13+00:00
88	Trever Putland	3195 Wettstein Way, Arlington, Texas, United States, 76096	2208	Zucchini	Renewable energy sources	2024-09-02T05:57:02+00:00
89	Welch Brinsden	8344 Overbrook Court, Frederick, Maryland, United States, 21705	5607	Herbs	Greenhouse automation	2024-05-03T17:33:46+00:00
90	Gabbie Clemmett	5077 Tarrson Blvd., Tampa, Florida, United States, 33694	3450	Spinach	Bioponics	2024-03-02T18:27:12+00:00
91	Marianna Stubbs	8442 Olenda Drive, El Paso, Texas, United States, 79977	5672	Lettuce	Aquaponics	2024-09-15T04:15:22+00:00

92	Marna Ramlot	7776 Keith Lane, Oklahoma City, Oklahoma, United States, 73157	5232	Bell Pepper	Soil-based cultivation	2024-07-30T22:14:15+00:00
93	Vaughn Claydon	12197 Gaucho Way, Houston, Texas, United States, 77020	8150	Bell Pepper	Soil-based cultivation	2024-09-22T14:45:38+00:00
94	Bonni Torald	7217 Danisha Court, Salt Lake City, Utah, United States, 84110	4863	Bell Pepper	Soil-based cultivation	2024-10-10T05:31:46+00:00
95	Lari Snell	4678 Norman Run, Oklahoma City, Oklahoma, United States, 73119	3187	Tomato	Hydroponics	2024-07-29T15:59:11+00:00
96	Ugo Tsarovic	12727 Maisto Place, Evansville, Indiana, United States, 47732	8500	Eggplant	LED grow lights	2024-07-25T14:06:18+00:00
97	Mirelle Shave	10832 Mazzio Lane, Dallas, Texas,	7249	Lettuce	Aquaponics	2024-04-02T00:36:30+00:00

		United States, 75241				
98	Maurizia Callow	13032 Schoenfeldt Street, Tuscaloosa, Alabama, United States, 35487	8701	Spinach	Bioponics	2024-09-09T04:09:41+00:00
99	Dyna Searl	13754 Ballesteros Drive, Portland, Oregon, United States, 97229	9177	Lettuce	Aquaponics	2023-11-18T15:48:09+00:00
100	Arthur Giovanni	10780 Sonora Street, Louisville, Kentucky, United States, 40215	7214	Cucumber	Aeroponics	2024-08-05T16:34:19+00:00

14. IOT_Sensor

Sensor_ID	Sensor_Type	Greenhouse_ID	Installation_Date	Sensor_Status
1	Proximity	59	2024-06-08T15:52:35+00:00	Disconnected
2	Proximity	90	2024-10-01T04:45:12+00:00	Maintenance
3	Soil Moisture	55	2024-05-26T20:23:27+00:00	Disconnected
4	Proximity	55	2024-03-01T17:26:43+00:00	Faulty
5	Motion	21	2024-05-26T14:44:36+00:00	Online
6	Proximity	62	2024-01-22T11:50:58+00:00	Offline
7	Light	73	2024-07-18T13:05:14+00:00	Calibrating
8	Acceleration	47	2024-06-20T14:25:14+00:00	Maintenance
9	Vibration	34	2024-07-31T07:31:37+00:00	Faulty
10	Acceleration	37	2024-04-26T06:55:06+00:00	Online
11	Gas	21	2024-03-11T12:22:32+00:00	Offline
12	Sound	89	2024-03-22T00:13:00+00:00	Offline

13	Sound	28	2024-01-23T16:20:58+00:00	Faulty
14	Light	79	2024-09-27T14:46:35+00:00	Inactive
15	Soil Moisture	71	2024-06-23T08:28:54+00:00	Disconnected
16	Vibration	30	2024-02-18T05:38:57+00:00	Active
17	Motion	100	2024-08-23T14:17:38+00:00	Disconnected
18	Magnetic Field	17	2024-07-23T15:17:28+00:00	Active
19	Acceleration	37	2024-02-25T00:36:31+00:00	Offline
20	Motion	77	2024-08-02T03:52:02+00:00	Maintenance
21	Acceleration	21	2024-11-08T09:59:24+00:00	Maintenance
22	Pressure	29	2024-01-09T08:47:42+00:00	Disconnected
23	Soil Moisture	51	2024-09-29T19:23:42+00:00	Maintenance
24	Sound	78	2024-03-22T14:36:43+00:00	Error
25	Magnetic Field	6	2024-01-23T04:02:20+00:00	Inactive
26	Light	52	2023-12-26T15:28:35+00:00	Calibrating
27	Humidity	6	2024-02-20T09:03:27+00:00	Error
28	Motion	72	2024-09-29T20:56:51+00:00	Calibrating
29	Soil Moisture	20	2024-05-13T06:52:33+00:00	Online
30	Liquid Flow	36	2024-08-18T20:31:17+00:00	Maintenance
31	Magnetic Field	97	2023-11-28T06:17:54+00:00	Disconnected
32	Temperature	35	2024-05-14T06:58:37+00:00	Maintenance

33	Liquid Flow	54	2023-11-29T01:13:22+00:00	Offline
34	Temperature	82	2024-03-27T05:42:19+00:00	Calibrating
35	Sound	81	2024-07-26T12:01:04+00:00	Online
36	Acceleration	42	2024-01-18T14:14:33+00:00	Disconnected
37	Pressure	35	2024-03-17T20:41:46+00:00	Faulty
38	Sound	51	2024-10-28T15:09:13+00:00	Online
39	UV Light	36	2024-05-23T12:21:31+00:00	Offline
40	Sound	74	2024-03-05T07:48:25+00:00	Maintenance
41	Proximity	46	2024-09-02T12:49:59+00:00	Idle
42	Motion	79	2023-12-26T21:34:30+00:00	Maintenance
43	Water Quality	61	2024-04-07T12:45:38+00:00	Calibrating
44	Humidity	53	2024-08-29T11:35:53+00:00	Disconnected
45	Gas	90	2024-06-15T12:58:52+00:00	Calibrating
46	Water Quality	25	2024-04-09T12:52:48+00:00	Maintenance
47	Gas	77	2024-06-27T01:35:07+00:00	Calibrating
48	Vibration	88	2024-03-13T20:56:43+00:00	Maintenance
49	Sound	68	2024-05-11T21:59:46+00:00	Disconnected
50	Liquid Flow	30	2024-03-18T17:08:13+00:00	Disconnected
51	Sound	69	2024-08-04T09:13:43+00:00	Disconnected
52	Magnetic Field	74	2024-04-23T22:45:11+00:00	Active

53	Gas	28	2024-08-21T12:57:17+00:00	Error
54	Magnetic Field	78	2024-06-17T19:44:14+00:00	Disconnected
55	Vibration	96	2024-05-18T02:45:53+00:00	Calibrating
56	Liquid Flow	47	2024-10-02T10:03:37+00:00	Idle
57	Soil Moisture	31	2024-02-05T20:11:38+00:00	Maintenance
58	Light	41	2024-08-15T02:42:46+00:00	Online
59	Magnetic Field	29	2024-09-25T06:12:47+00:00	Offline
60	Soil Moisture	78	2024-07-12T23:26:41+00:00	Error
61	Acceleration	34	2024-06-23T08:00:32+00:00	Online
62	Motion	46	2024-07-17T05:45:09+00:00	Online
63	Vibration	32	2024-08-04T22:13:56+00:00	Idle
64	Acceleration	55	2024-02-16T18:06:12+00:00	Calibrating
65	Magnetic Field	52	2024-08-18T01:09:31+00:00	Inactive
66	Motion	57	2024-03-12T08:09:18+00:00	Disconnected
67	Magnetic Field	3	2024-10-22T15:15:23+00:00	Calibrating
68	Sound	85	2024-04-28T13:27:32+00:00	Idle
69	UV Light	54	2024-02-29T23:22:19+00:00	Calibrating
70	Liquid Flow	48	2024-04-07T07:52:02+00:00	Error
71	Motion	46	2024-06-01T13:26:04+00:00	Calibrating
72	Gas	96	2023-12-08T04:58:20+00:00	Idle

73	Proximity	62	2024-04-06T19:02:47+00:00	Online
74	Humidity	40	2024-02-22T15:21:00+00:00	Disconnected
75	Gas	7	2024-08-17T13:55:00+00:00	Offline
76	Motion	75	2024-03-09T12:13:14+00:00	Maintenance
77	Magnetic Field	78	2024-04-24T18:44:35+00:00	Disconnected
78	Gas	83	2024-03-03T10:02:33+00:00	Error
79	Motion	60	2024-05-25T13:07:23+00:00	Error
80	Proximity	61	2024-05-15T13:48:10+00:00	Inactive
81	Liquid Flow	66	2024-06-01T21:56:23+00:00	Maintenance
82	Proximity	94	2023-11-17T21:24:19+00:00	Faulty
83	Temperature	45	2024-09-13T02:41:48+00:00	Error
84	Water Quality	10	2024-05-23T17:16:25+00:00	Offline
85	Proximity	57	2024-04-29T17:08:15+00:00	Calibrating
86	Liquid Flow	14	2024-10-24T03:17:17+00:00	Maintenance
87	Gas	55	2024-03-05T03:33:30+00:00	Idle
88	UV Light	60	2024-06-21T05:02:55+00:00	Online
89	Motion	50	2024-03-31T16:20:32+00:00	Faulty
90	Vibration	44	2023-12-02T21:45:02+00:00	Disconnected
91	Sound	93	2024-08-07T03:47:15+00:00	Idle
92	Magnetic Field	43	2024-08-17T21:01:20+00:00	Faulty

93	Magnetic Field	81	2024-09-07T06:53:35+00:00	Online
94	Water Quality	49	2024-06-14T10:53:15+00:00	Active
95	Proximity	18	2024-06-17T07:31:55+00:00	Active
96	Vibration	38	2024-07-04T16:25:46+00:00	Faulty
97	Vibration	93	2024-10-15T00:20:38+00:00	Maintenance
98	Gas	20	2024-04-19T16:46:31+00:00	Inactive
99	Sound	39	2024-03-27T08:40:54+00:00	Active
100	Humidity	89	2023-12-13T08:15:55+00:00	Error

15. Maintenance_Record

Maintenance_ID	Greenhouse_ID	User_ID	Date_Performed	Task_Description	Sensor_ID
1	18	18	2024-01-12T09:06:26+00:00	Inspecting for pest infestation	18
2	48	48	2024-05-01T14:38:30+00:00	Testing soil pH levels	48
3	4	4	2023-11-22T15:00:03+00:00	Pruning dead leaves	4
4	7	7	2023-12-03T11:10:07+00:00	Applying fertilizer to soil	7
5	13	13	2023-12-23T14:39:17+00:00	Updating greenhouse logs and records	13
6	91	91	2024-10-04T01:50:18+00:00	Inspecting for pest infestation	91
7	4	4	2023-11-23T10:35:02+00:00	Conducting plant disease inspection	4
8	18	18	2024-01-12T11:28:48+00:00	Maintaining predator deterrents	18
9	15	15	2024-08-16T09:23:47+00:00	Calibrating humidity sensors	15
10	77	77	2024-09-17T18:43:33+00:00	Cleaning greenhouse surfaces	77
11	86	86	2024-03-06T11:30:51+00:00	Monitoring plant growth rates	86

12	33	33	2024-02-18T09:10:01+00:00	Organizing storage areas	33
13	28	28	2024-10-02T05:02:32+00:00	Testing soil pH levels	28
14	90	90	2024-11-05T14:53:28+00:00	Checking and adjusting temperature settings	90
15	50	50	2024-05-08T00:04:46+00:00	Removing weeds	50
16	44	44	2024-04-15T05:49:34+00:00	Pruning dead leaves	44
17	72	72	2024-07-28T21:54:39+00:00	Testing soil pH levels	72
18	24	24	2024-02-05T00:29:28+00:00	Repairing irrigation system	24
19	14	14	2024-02-02T14:52:06+00:00	Repairing irrigation system	14
20	30	30	2023-12-28T00:11:29+00:00	Planting new seeds or seedlings	30
21	47	47	2024-02-26T04:33:44+00:00	Planting new seeds or seedlings	47
22	55	55	2024-04-28T00:37:42+00:00	Applying fertilizer to soil	55
23	21	21	2024-05-27T19:15:55+00:00	Monitoring plant growth rates	21
24	44	44	2024-01-24T01:00:53+00:00	Calibrating humidity sensors	44
25	53	53	2024-07-22T15:53:39+00:00	Conducting plant disease inspection	53
26	75	75	2024-04-17T03:32:46+00:00	Removing weeds	75
27	55	55	2024-05-18T02:30:18+00:00	Watering plants	55
28	75	75	2024-08-07T05:08:13+00:00	Pruning dead leaves	75
29	48	48	2024-05-27T12:26:37+00:00	Training new staff on equipment use	48
30	57	57	2023-12-08T18:29:02+00:00	Harvesting mature crops	57

31	85	85	2024-04-29T16:16:09+00:00	Repairing irrigation system	85
32	61	61	2024-06-03T01:36:36+00:00	Updating greenhouse logs and records	61
33	100	100	2024-03-16T12:09:37+00:00	Removing weeds	100
34	89	89	2024-06-01T01:29:59+00:00	Testing soil pH levels	89
35	89	89	2024-06-16T09:59:11+00:00	Calibrating humidity sensors	89
36	13	13	2024-11-06T11:01:33+00:00	Testing soil pH levels	13
37	41	41	2024-06-19T16:00:56+00:00	Repairing irrigation system	41
38	31	31	2024-09-28T00:28:26+00:00	Applying fertilizer to soil	31
39	77	77	2024-09-28T11:01:19+00:00	Liaising with suppliers for inventory	77
40	53	53	2023-12-25T22:47:07+00:00	Maintaining predator deterrents	53
41	1	1	2024-04-05T23:16:05+00:00	Replacing broken pots	1
42	20	20	2024-02-27T21:27:04+00:00	Inspecting for pest infestation	20
43	6	6	2024-08-16T08:14:39+00:00	Updating greenhouse logs and records	6
44	29	29	2024-05-18T02:46:51+00:00	Repairing irrigation system	29
45	97	97	2023-11-10T15:34:18+00:00	Conducting plant disease inspection	97
46	66	66	2024-01-18T20:17:47+00:00	Watering plants	66
47	79	79	2023-11-30T16:02:12+00:00	Monitoring plant growth rates	79
48	79	79	2024-02-22T01:58:58+00:00	Monitoring plant growth rates	79
49	56	56	2024-10-28T11:05:11+00:00	Checking and adjusting	56

				temperature settings	
50	59	59	2024-07-05T12:47:02+00:00	Maintaining predator deterrents	59
51	100	100	2024-08-23T05:04:18+00:00	Liaising with suppliers for inventory	100
52	35	35	2024-08-23T08:11:43+00:00	Replacing broken pots	35
53	52	52	2024-05-29T16:06:52+00:00	Applying fertilizer to soil	52
54	30	30	2024-06-09T09:08:15+00:00	Training new staff on equipment use	30
55	48	48	2024-09-29T17:41:50+00:00	Liaising with suppliers for inventory	48
56	39	39	2024-03-13T20:25:18+00:00	Training new staff on equipment use	39
57	15	15	2024-10-14T17:46:12+00:00	Liaising with suppliers for inventory	15
58	95	95	2024-05-15T20:18:18+00:00	Inspecting for pest infestation	95
59	46	46	2024-02-25T19:38:07+00:00	Organizing storage areas	46
60	90	90	2024-05-01T16:56:13+00:00	Checking and adjusting temperature settings	90
61	57	57	2024-03-02T00:17:41+00:00	Checking and adjusting temperature settings	57
62	12	12	2024-03-28T18:25:08+00:00	Conducting plant disease inspection	12
63	82	82	2023-12-30T21:45:04+00:00	Testing soil pH levels	82
64	50	50	2024-10-21T05:56:38+00:00	Conducting plant disease inspection	50

65	19	19	2024-06-30T12:57:40+00:00	Checking and adjusting temperature settings	19
66	91	91	2024-10-02T04:48:24+00:00	Removing weeds	91
67	56	56	2024-06-03T13:29:14+00:00	Testing soil pH levels	56
68	77	77	2023-12-20T18:04:20+00:00	Watering plants	77
69	14	14	2024-09-02T20:48:55+00:00	Repairing irrigation system	14
70	1	1	2024-09-26T13:37:35+00:00	Calibrating humidity sensors	1
71	95	95	2024-03-27T14:30:42+00:00	Cleaning greenhouse surfaces	95
72	42	42	2024-05-08T13:39:34+00:00	Planting new seeds or seedlings	42
73	43	43	2024-01-14T17:17:25+00:00	Conducting plant disease inspection	43
74	22	22	2024-10-04T05:48:55+00:00	Cleaning greenhouse surfaces	22
75	86	86	2024-05-30T16:23:32+00:00	Applying fertilizer to soil	86
76	10	10	2024-08-15T20:01:08+00:00	Monitoring plant growth rates	10
77	81	81	2023-12-29T23:49:12+00:00	Planting new seeds or seedlings	81
78	14	14	2023-11-09T18:40:04+00:00	Maintaining predator deterrents	14
79	36	36	2024-10-20T00:19:41+00:00	Applying fertilizer to soil	36
80	12	12	2024-04-09T07:59:25+00:00	Maintaining predator deterrents	12
81	50	50	2024-04-13T14:43:46+00:00	Applying fertilizer to soil	50
82	100	100	2024-01-26T19:38:23+00:00	Maintaining predator deterrents	100

83	60	60	2023-12-15T13:15:26+00:00	Maintaining predator deterrents	60
84	96	96	2024-09-15T20:56:52+00:00	Watering plants	96
85	79	79	2024-05-24T16:59:10+00:00	Harvesting mature crops	79
86	40	40	2023-12-13T22:09:03+00:00	Maintaining predator deterrents	40
87	94	94	2024-08-29T15:33:35+00:00	Testing soil pH levels	94
88	83	83	2023-12-29T14:59:53+00:00	Cleaning greenhouse surfaces	83
89	39	39	2024-03-18T11:48:55+00:00	Testing soil pH levels	39
90	83	83	2023-12-20T16:39:49+00:00	Cleaning greenhouse surfaces	83
91	16	16	2024-05-07T04:42:44+00:00	Conducting plant disease inspection	16
92	69	69	2024-11-07T20:14:14+00:00	Organizing storage areas	69
93	22	22	2024-06-14T17:45:08+00:00	Watering plants	22
94	5	5	2024-10-22T11:34:47+00:00	Repairing irrigation system	5
95	22	22	2024-11-05T23:14:00+00:00	Replacing broken pots	22
96	77	77	2024-08-23T09:26:08+00:00	Removing weeds	77
97	47	47	2024-10-16T09:50:46+00:00	Watering plants	47
98	76	76	2024-09-05T12:14:02+00:00	Inspecting for pest infestation	76
99	21	21	2024-10-29T11:59:55+00:00	Updating greenhouse logs and records	21
100	51	51	2024-03-30T04:11:38+00:00	Applying fertilizer to soil	51

16. Mobile_Application

App_ID	Version	Last_Update	User_ID
1	1.2.0	2024-02-06T17:30:59+00:00	25
2	2.1.0	2024-04-25T10:10:15+00:00	91
3	4.0.0	2024-08-24T09:43:42+00:00	78

4	2.2.0	2024-10-05T11:38:33+00:00	53
5	1.2.0	2024-08-20T05:43:35+00:00	99
6	2.2.0	2023-12-12T13:10:13+00:00	38
7	3.2.0	2024-05-19T13:51:11+00:00	70
8	2.0.0	2024-11-03T03:41:31+00:00	25
9	2.1.0	2024-03-26T21:03:55+00:00	53
10	3.0.0	2024-07-21T17:52:14+00:00	85
11	4.0.0	2024-02-07T18:29:40+00:00	20
12	2.1.0	2024-05-20T07:39:35+00:00	69
13	3.1.0	2024-09-13T02:10:55+00:00	36
14	3.0.0	2024-01-20T12:17:52+00:00	45
15	1.1.0	2024-07-16T04:16:16+00:00	96
16	3.1.0	2024-03-18T04:31:41+00:00	19
17	1.0.0	2024-04-20T16:21:52+00:00	89
18	3.0.0	2024-06-23T12:15:37+00:00	59
19	3.2.0	2024-10-24T18:57:44+00:00	45
20	3.1.0	2024-01-15T00:03:41+00:00	47
21	2.1.0	2024-06-09T13:00:39+00:00	48
22	3.2.0	2024-04-19T21:21:15+00:00	28
23	1.2.0	2024-04-28T06:15:20+00:00	72
24	1.2.0	2024-05-01T12:53:02+00:00	66
25	3.2.0	2024-02-16T11:25:07+00:00	13
26	3.2.0	2024-07-29T05:55:52+00:00	74
27	2.2.0	2024-07-05T02:04:12+00:00	3
28	3.0.0	2023-12-24T21:23:27+00:00	65
29	2.1.0	2024-08-03T14:19:01+00:00	81
30	2.0.0	2023-11-18T08:57:36+00:00	40
31	2.2.0	2024-07-02T20:15:28+00:00	46
32	1.0.0	2024-08-30T01:03:14+00:00	22
33	2.0.0	2024-07-29T23:56:18+00:00	26
34	3.0.0	2024-04-01T02:07:34+00:00	82
35	2.0.0	2024-09-04T02:33:24+00:00	90

36	1.2.0	2024-01-27T16:42:23+00:00	29
37	3.2.0	2024-02-11T04:48:42+00:00	61
38	1.2.0	2024-02-19T12:42:37+00:00	57
39	2.0.0	2024-09-08T05:14:36+00:00	48
40	3.1.0	2023-12-15T20:23:18+00:00	32
41	3.2.0	2024-10-01T18:16:50+00:00	55
42	3.1.0	2024-05-24T16:01:28+00:00	1
43	2.2.0	2024-02-20T22:52:25+00:00	97
44	2.0.0	2024-06-17T22:23:31+00:00	35
45	1.0.0	2024-06-03T19:02:04+00:00	65
46	3.0.0	2024-05-02T03:10:14+00:00	21
47	2.2.0	2024-03-03T19:58:24+00:00	86
48	3.0.0	2024-05-26T17:33:27+00:00	25
49	1.0.0	2023-11-09T20:13:37+00:00	35
50	1.1.0	2024-10-27T15:50:50+00:00	19
51	1.1.0	2024-03-14T11:49:40+00:00	72
52	3.1.0	2024-06-05T04:05:01+00:00	85
53	3.0.0	2024-03-01T09:59:21+00:00	74
54	2.1.0	2024-01-23T06:50:24+00:00	70
55	2.2.0	2024-09-18T00:17:49+00:00	51
56	2.0.0	2024-02-05T15:34:58+00:00	36
57	3.2.0	2024-03-14T03:30:27+00:00	1
58	2.2.0	2024-01-15T22:19:05+00:00	67
59	3.1.0	2024-07-28T04:56:39+00:00	52
60	3.2.0	2024-09-13T22:02:39+00:00	64
61	1.2.0	2024-08-05T13:58:28+00:00	39
62	4.0.0	2024-07-20T23:12:49+00:00	5
63	3.2.0	2024-05-13T05:00:13+00:00	13
64	4.0.0	2024-03-17T23:19:26+00:00	11
65	1.0.0	2023-11-10T06:26:54+00:00	29
66	1.1.0	2024-07-04T00:40:15+00:00	88
67	2.0.0	2024-07-10T05:36:37+00:00	65

68	1.2.0	2024-05-17T01:19:17+00:00	28
69	2.1.0	2024-06-27T08:22:17+00:00	54
70	2.1.0	2024-03-29T14:26:01+00:00	82
71	1.0.0	2023-11-24T17:10:30+00:00	51
72	1.0.0	2023-12-25T21:54:55+00:00	27
73	2.0.0	2023-12-18T16:34:09+00:00	71
74	1.1.0	2024-08-13T04:39:49+00:00	82
75	3.2.0	2024-02-21T03:56:39+00:00	40
76	3.1.0	2024-03-23T14:36:31+00:00	78
77	3.2.0	2024-09-25T13:38:54+00:00	18
78	3.1.0	2024-07-01T02:19:05+00:00	24
79	1.1.0	2024-04-18T01:54:36+00:00	80
80	1.1.0	2024-02-19T04:36:39+00:00	97
81	2.1.0	2024-05-22T00:01:59+00:00	96
82	1.2.0	2024-09-03T09:08:59+00:00	78
83	3.1.0	2024-05-12T22:51:25+00:00	1
84	1.1.0	2024-02-15T01:37:03+00:00	11
85	3.2.0	2024-10-29T05:43:54+00:00	39
86	4.0.0	2024-07-24T07:51:41+00:00	32
87	4.0.0	2024-09-01T09:22:29+00:00	98
88	3.0.0	2024-04-01T21:13:36+00:00	22
89	2.2.0	2024-08-18T05:57:42+00:00	41
90	4.0.0	2024-01-11T01:25:13+00:00	40
91	2.0.0	2024-02-02T00:32:46+00:00	7
92	3.1.0	2024-08-27T12:06:57+00:00	80
93	2.0.0	2024-10-26T05:58:58+00:00	10
94	2.1.0	2024-09-04T12:03:23+00:00	1
95	1.0.0	2024-10-22T22:26:13+00:00	33
96	2.2.0	2024-08-18T13:39:33+00:00	17
97	3.1.0	2023-11-11T08:39:47+00:00	98
98	3.0.0	2023-12-18T13:05:13+00:00	83
99	1.0.0	2024-03-30T13:05:35+00:00	19

100	1.0.0	2024-02-16T08:30:47+00:00	98

17. Sensor_Manufacturer

Manufacturer_ID	Manufacturer_Name	Sensor_Type	Product_Line	Location	Distribution_Network	Start_Date
1	EcoSensor Technologies	Motion	Level Sensors	7561 Keyhole Street, Saginaw, Michigan, United States, 48609	Theta Dynamics	2024-05-12T03:05:24+00:00
2	NextGen Sensors	Vibration	Magnetic Sensors	4196 Ruby Road, Naples, Florida, United States, 33963	Epsilon Systems	2024-02-20T00:04:54+00:00
3	NextGen Sensors	Vibration	Magnetic Sensors	12124 Collopy Place, Amarillo, Texas, United States, 79165	Nu Components	2024-08-31T10:49:18+00:00
4	Innovative Sensors Ltd.	Humidity	Humidity Sensors	14597 Emporia Place, Tacoma, Washington, United States, 98405	Omicron Industries	2024-10-30T19:39:08+00:00
5	DataStream Technologies	Light	Flow Sensors	5720 Rosario Road, Peoria, Illinois, United States, 61605	Zeta Networks	2024-03-28T04:47:59+00:00

6	Innovative Sensors Ltd.	Humidity	Humidity Sensors	11481 Pineland Terrace, Pittsburgh, Pennsylvania, United States, 15279	Mu Technologies	2024-08-15T18:47:20+00:00
7	Innovative Sensors Ltd.	Humidity	Humidity Sensors	11873 Jessmyth Place, Knoxville, Tennessee, United States, 37939	Mu Technologies	2024-08-25T08:02:06+00:00
8	SmartSense Corp.	pH	Proximity Sensors	1111 Oxford Lane, Inglewood, California, United States, 90305	Beta Electronics	2023-12-06T17:25:18+00:00
9	Innovative Sensors Ltd.	Humidity	Humidity Sensors	12328 Canova Draney Loop, Beaumont, Texas, United States, 77705	Nu Components	2024-09-05T10:43:51+00:00
10	TechWave Solutions	Pressure	Pressure Sensors	2720 Cherry Creek Way, Greeley, Colorado, United States, 80638	Gamma Devices	2024-01-14T23:29:47+00:00
11	DataStream Technologies	Light	Flow Sensors	3143 Santa Rosa Court,	Delta Distributors	2024-01-25T07:23:58+00:00

				Washington, District of Columbia, United States, 20231		
12	Sensortech Inc.	Temperature	Temperature Sensors	6013 Boyd Circle, Indianapolis, Indiana, United States, 46202	Eta Instruments	2024-04-04T08:14:09+00:00
13	Sensor Dynamics	Sound	Gyroscope Sensors	3426 Zientara Loop, Washington, District of Columbia, United States, 20591	Delta Distributors	2024-02-01T05:26:35+00:00
14	Quantum Innovations	Gas	Light Sensors	13047 Jeff Anderson Way, Houston, Texas, United States, 77030	Xi Enterprises	2024-09-22T23:54:23+00:00
15	SmartSense Corp.	pH	Proximity Sensors	13182 Turbeville Terrace, Houston, Texas, United States, 77212	Xi Enterprises	2024-09-26T06:41:54+00:00
16	DataStream Technologies	Light	Flow Sensors	3151 Diaz Lane, Washington, District of	Delta Distributors	2024-01-25T11:53:21+00:00

				Columbia, United States, 20238		
17	Sensortech Inc.	Temperature	Temperature Sensors	4541 Rish Place, Seminole, Florida, United States, 34642	Epsilon Systems	2024-02-28T10:26:35+00:00
18	TechWave Solutions	Pressure	Pressure Sensors	3176 McMurtrie Loop, Washington, District of Columbia, United States, 20268	Delta Distributors	2024-01-26T02:47:35+00:00
19	TechWave Solutions	Pressure	Pressure Sensors	11887 Berkshire Place, Memphis, Tennessee, United States, 38104	Mu Technologies	2024-08-25T16:19:21+00:00
20	EcoSensor Technologies	Motion	Level Sensors	2019 Sierra Blanca Court, San Francisco, California, United States, 94126	Gamma Devices	2023-12-28T21:27:52+00:00
21	Quantum Innovations	Gas	Light Sensors	11752 Storms Avenue, Sioux Falls, South Dakota,	Mu Technologies	2024-08-22T09:29:50+00:00

				United States, 57110		
22	EcoSensor Technologies	Motion	Level Sensors	6913 Hortensia Place, Boston, Massachusetts, United States, 02124	Eta Instruments	2024-04-26T07:29:02+00:00
23	EcoSensor Technologies	Motion	Level Sensors	8560 Kenya Street, Greensboro, North Carolina, United States, 27415	Iota Controls	2024-06-05T12:08:34+00:00
24	Sensor Dynamics	Sound	Gyroscope Sensors	499 Suffolk Street, Mesa, Arizona, United States, 85205	Alpha Sensors	2023-11-21T19:07:13+00:00
25	EcoSensor Technologies	Motion	Level Sensors	10897 Troy Loop, Tulsa, Oklahoma, United States, 74126	Lambda Innovations	2024-08-01T12:22:58+00:00
26	NextGen Sensors	Vibration	Magnetic Sensors	5611 Fritillary Terrace, Falls Church, Virginia, United States, 22047	Zeta Networks	2024-03-25T12:48:38+00:00

27	Innovative Sensors Ltd.	Humidity	Humidity Sensors	13985 Ukulele Street, Athens, Georgia, United States, 30610	Epsilon Systems	2024-10-15T21:02:32+00:00
28	TechWave Solutions	Pressure	Pressure Sensors	4774 Xanthus Court, Worcester, Massachusetts, United States, 01605	Zeta Networks	2024-03-05T02:44:43+00:00
29	NextGen Sensors	Vibration	Magnetic Sensors	5603 McKown Lane, Lexington, Kentucky, United States, 40505	Theta Dynamics	2024-03-25T08:08:06+00:00
30	EcoSensor Technologies	Motion	Level Sensors	7081 Antigua Place, Los Angeles, California, United States, 90071	Eta Instruments	2024-04-30T09:58:59+00:00
31	Precision Instruments	Proximity	Accelerometer Sensors	6390 Craven Way, Evansville, Indiana, United States, 47705	Beta Electronics	2024-04-13T13:15:53+00:00
32	SmartSense Corp.	pH	Proximity Sensors	1316 Melbourne Lane, Clevelan	Zeta Networks	2023-12-11T17:38:21+00:00

				d, Ohio, United States, 44111		
33	TechWave Solutions	Pressure	Pressure Sensors	5884 Isabella Avenue, Tucson, Arizona, United States, 85720	Lambda Innovations	2024-04-01T04:36:44+00:00
34	NextGen Sensors	Vibration	Magnetic Sensors	10396 Cordero Court, Boulder, Colorado, United States, 80310	Alpha Sensors	2024-07-20T07:08:12+00:00
35	EcoSensor Technologies	Motion	Level Sensors	722 Roseapple Avenue, Van Nuys, California, United States, 91411	Gamma Devices	2023-11-27T05:24:22+00:00
36	EcoSensor Technologies	Motion	Level Sensors	2089 Peakman Road, Saint Cloud, Minnesota, United States, 56398	Gamma Devices	2023-12-30T14:09:35+00:00
37	Quantum Innovations	Gas	Light Sensors	2468 Sage Street, New York City, New York, United States, 10292	Gamma Devices	2024-01-08T20:21:12+00:00

38	Innovative Sensors Ltd.	Humidity	Humidity Sensors	2379 Gibbes Way, Aiken, South Carolina, United States, 29805	Theta Dynamics	2024-01-06T15:59:24+00:00
39	Innovative Sensors Ltd.	Humidity	Humidity Sensors	7782 Corsair Court, Portsmouth, Virginia, United States, 23705	Mu Technologies	2024-07-10T12:20:37+00:00
40	SmartSense Corp.	pH	Proximity Sensors	9995 Neira Lane, Jefferson City, Missouri, United States, 65110	Omicron Industries	2024-08-18T08:32:32+00:00
41	TechWave Solutions	Pressure	Pressure Sensors	11587 Beaumont Terrace, Hartford, Connecticut, United States, 06160	Theta Dynamics	2024-10-19T01:08:15+00:00
42	Sensor Dynamics	Sound	Gyroscope Sensors	14115 Markridge Loop, Charlotte, North Carolina, United States, 28230	Gamma Devices	2024-05-21T06:08:22+00:00
43	Quantum Innovations	Gas	Light Sensors	7935 Fraser Court, Winston	Iota Controls	2024-01-18T02:23:47+00:00

				Salem, North Carolina, United States, 27150		
44	NextGen Sensors	Vibration	Magnetic Sensors	2847 El Esparza Lane, Portland, Oregon, United States, 97296	Iota Controls	2024-06-08T22:58:19+00:00
45	Precision Instruments	Proximity	Accelerometer Sensors	8411 San Jose Place, Jefferson City, Missouri, United States, 65110	Gamma Devices	2024-01-13T15:46:39+00:00
46	Quantum Innovations	Gas	Light Sensors	8702 Silver Oak Avenue, Arlington, Texas, United States, 76011	Mu Technologies	2024-08-05T10:28:26+00:00
47	Innovative Sensors Ltd.	Humidity	Humidity Sensors	2665 Juniper Lane, Washington, District of Columbia, United States, 20566	Theta Dynamics	2024-05-21T06:18:05+00:00
48	Sensortech Inc.	Temperature	Temperature Sensors	11057 Mariano Lane, New York City, New York, United	Nu Components	2024-09-01T20:04:51+00:00

				States, 10184		
49	Precision Instruments	Proximity	Accelerometer Sensors	7936 Gaskin Lane, Boulder, Colorado, United States, 80328	Delta Distributors	2024-01-31T19:01:34+00:00
50	Sensor Dynamics	Sound	Gyroscope Sensors	12180 Soper Street, Beaumont, Texas, United States, 77713	Gamma Devices	2024-07-09T02:39:28+00:00
51	EcoSensor Technologies	Motion	Level Sensors	3409 Netherwood Place, Cincinnati, Ohio, United States, 45218	Beta Electronics	2024-01-08T23:38:19+00:00
52	Innovative Sensors Ltd.	Humidity	Humidity Sensors	9938 Renee Terrace, Saint Paul, Minnesota, United States, 55172	Nu Components	2023-12-23T13:36:33+00:00
53	NextGen Sensors	Vibration	Magnetic Sensors	2474 Sweet Bay Trail, Sioux Falls, South Dakota, United States, 57188	Lambda Innovations	2024-09-05T15:44:14+00:00
54	EcoSensor Technologies	Motion	Level Sensors	1801 Stella Street, Huntingto	Theta Dynamics	2024-07-17T14:47:18+00:00

				n, West Virginia, United States, 25726		
55	NextGen Sensors	Vibration	Magnetic Sensors	12337 Stratford Lane, Tacoma, Washington, United States, 98464	Mu Technologies	2024-05-19T01:51:07+00:00
56	Innovative Sensors Ltd.	Humidity	Humidity Sensors	10286 Flaxmayer Road, Albuquerque, New Mexico, United States, 87110	Omicron Industries	2024-08-22T16:52:22+00:00
57	NextGen Sensors	Vibration	Magnetic Sensors	7846 Azalea Drive, Vero Beach, Florida, United States, 32969	Kappa Solutions	2024-11-08T12:19:31+00:00
58	NextGen Sensors	Vibration	Magnetic Sensors	11765 Fish Camp Road, San Diego, California, United States, 92105	Epsilon Systems	2024-10-31T22:46:54+00:00
59	Precision Instruments	Proximity	Accelerometer Sensors	14954 Webster Way, Dallas, Texas, United	Beta Electronics	2024-06-17T10:53:28+00:00

				States, 75236		
60	NextGen Sensors	Vibration	Magnetic Sensors	14644 Mapp Place, Newton, Massachusetts, United States, 02162	Nu Components	2024-03-03T02:35:00+00:00
61	DataStream Technologies	Light	Flow Sensors	9050 River Oaks Circle, Meridian, Mississippi, United States, 39305	Theta Dynamics	2023-12-24T23:42:02+00:00
62	DataStream Technologies	Light	Flow Sensors	4692 Ottley Terrace, Saint Paul, Minnesota, United States, 55123	Iota Controls	2024-09-08T23:07:59+00:00
63	DataStream Technologies	Light	Flow Sensors	1859 Creighton Loop, Battle Creek, Michigan, United States, 49018	Theta Dynamics	2024-04-28T15:56:51+00:00
64	Innovative Sensors Ltd.	Humidity	Humidity Sensors	12472 Randolph Loop, Tyler, Texas, United States, 75705	Theta Dynamics	2024-05-30T04:10:45+00:00

65	EcoSensor Technologies	Motion	Level Sensors	7010 Rostas Way, Glendale, California, United States, 91205	Xi Enterprises	2024-05-06T01:19:21+00:00
66	EcoSensor Technologies	Motion	Level Sensors	8301 Desota Court, Canton, Ohio, United States, 44710	Beta Electronics	2024-10-07T23:30:49+00:00
67	EcoSensor Technologies	Motion	Level Sensors	7790 Hollyberry Place, Winston Salem, North Carolina, United States, 27116	Lambda Innovations	2023-12-05T20:54:53+00:00
68	Quantum Innovations	Gas	Light Sensors	7313 Mallard Lane, Gainesville, Florida, United States, 32627	Iota Controls	2024-07-16T12:26:22+00:00
69	Sensor Dynamics	Sound	Gyroscope Sensors	13661 Corona Avenue, Jacksonville, Florida, United States, 32259	Delta Distributors	2024-06-08T20:41:09+00:00
70	NextGen Sensors	Vibration	Magnetic Sensors	1076 Yeamans Place, Saint Petersbu	Delta Distributors	2024-02-10T03:59:36+00:00

				rg, Florida, United States, 33742		
71	Sensor Dynamics	Sound	Gyroscope Sensors	10241 Norwood Street, San Jose, California, United States, 95128	Epsilon Systems	2024-02-13T06:56:13+00:00
72	DataStream Technologies	Light	Flow Sensors	8698 Kerry Place, Milwaukee, Wisconsin, United States, 53263	Gamma Devices	2024-02-27T16:29:59+00:00
73	Quantum Innovations	Gas	Light Sensors	3793 Pace Lane, Charleston, South Carolina, United States, 29424	Omicron Industries	2023-12-31T15:29:22+00:00
74	Quantum Innovations	Gas	Light Sensors	3921 Lime Grove Lane, Greensboro, North Carolina, United States, 27425	Mu Technologies	2024-08-19T13:22:23+00:00
75	TechWave Solutions	Pressure	Pressure Sensors	4511 Perry Lane, Dayton, Ohio, United	Iota Controls	2024-06-05T15:41:40+00:00

				States, 45403		
76	NextGen Sensors	Vibration	Magnetic Sensors	2132 Rosella Place, Columbia, South Carolina, United States, 29220	Lambda Innovations	2024-07-23T11:26:13+00:00
77	SmartSense Corp.	pH	Proximity Sensors	14817 Dees Drive, Cleveland, Ohio, United States, 44111	Mu Technologies	2024-08-20T06:10:21+00:00
78	TechWave Solutions	Pressure	Pressure Sensors	11636 Mansfield Street, Miami, Florida, United States, 33180	Lambda Innovations	2024-07-20T07:25:31+00:00
79	TechWave Solutions	Pressure	Pressure Sensors	8566 Diane Street, Fairfax, Virginia, United States, 22036	Epsilon Systems	2024-02-17T14:28:49+00:00
80	Sensortech Inc.	Temperature	Temperature Sensors	10526 Elana Place, Dallas, Texas, United States, 75353	Nu Components	2024-10-15T18:37:55+00:00
81	Quantum Innovations	Gas	Light Sensors	11665 Nugget Place, Chicago, Illinois, United	Kappa Solutions	2024-09-11T02:57:02+00:00

				States, 60657		
82	Quantum Innovations	Gas	Light Sensors	10397 Howard Court, Richmond, Virginia, United States, 23225	Zeta Networks	2024-06-19T20:19:29+00:00
83	Innovative Sensors Ltd.	Humidity	Humidity Sensors	4098 Foster Place, Washington, District of Columbia, United States, 20591	Omicron Industries	2024-03-25T12:15:42+00:00
84	Sensortech Inc.	Temperature	Temperature Sensors	13981 Craft Court, Albany, New York, United States, 12222	Delta Distributors	2024-10-21T02:32:28+00:00
85	TechWave Solutions	Pressure	Pressure Sensors	12561 Bolivar Street, Hamilton, Ohio, United States, 45020	Iota Controls	2024-02-01T08:08:28+00:00
86	Precision Instruments	Proximity	Accelerometer Sensors	9148 Forest Grove Run, Modesto, California, United States, 95354	Alpha Sensors	2024-06-10T06:47:46+00:00

87	Precision Instruments	Proximity	Accelerometer Sensors	5610 Barraw Terrace, Orlando, Florida, United States, 32885	Kappa Solutions	2023-11-21T22:09:50+00:00
88	Sensor Dynamics	Sound	Gyroscope Sensors	14199 Cimarron Avenue, East Saint Louis, Illinois, United States, 62205	Lambda Innovations	2024-06-25T03:56:31+00:00
89	EcoSensor Technologies	Motion	Level Sensors	3431 Island House Path, Dallas, Texas, United States, 75323	Beta Electronics	2024-07-25T11:14:50+00:00
90	Innovative Sensors Ltd.	Humidity	Humidity Sensors	8756 Riverdale Road, Jackson, Mississippi, United States, 39236	Iota Controls	2023-12-13T04:35:19+00:00
91	Quantum Innovations	Gas	Light Sensors	504 Zentko Street, Amarillo, Texas, United States, 79118	Theta Dynamics	2024-06-07T08:28:20+00:00
92	NextGen Sensors	Vibration	Magnetic Sensors	9366 Ladson Loop, Fargo, North Dakota,	Epsilon Systems	2024-05-17T10:49:53+00:00

				United States, 58122		
93	Sensortech Inc.	Temperature	Temperature Sensors	10608 Edenville Path, Washington, District of Columbia, United States, 20557	Zeta Networks	2024-02-22T17:46:06+00:00
94	TechWave Solutions	Pressure	Pressure Sensors	1376 Santee Place, Detroit, Michigan, United States, 48267	Mu Technologies	2024-03-27T06:07:53+00:00
95	EcoSensor Technologies	Motion	Level Sensors	8636 Owen Drive, El Paso, Texas, United States, 79916	Delta Distributors	2024-08-16T15:53:36+00:00
96	Innovative Sensors Ltd.	Humidity	Humidity Sensors	7780 Homeland Park Street, Fort Worth, Texas, United States, 76134	Nu Components	2024-02-05T21:45:49+00:00
97	Quantum Innovations	Gas	Light Sensors	4308 Fayette Court, Henderson, Nevada, United States, 89074	Iota Controls	2024-09-10T17:18:46+00:00

98	Precision Instruments	Proximity	Accelerometer Sensors	5682 Margarita Court, El Paso, Texas, United States, 79955	Nu Components	2024-05-29T16:42:19+00:00
99	DataStream Technologies	Light	Flow Sensors	11517 Abordale Lane, Milwaukee, Wisconsin, United States, 53205	Iota Controls	2024-09-01T09:12:44+00:00
100	Quantum Innovations	Gas	Light Sensors	3618 Heather Hill Loop, Myrtle Beach, South Carolina, United States, 29579	Delta Distributors	2024-06-[illegible]T18:56:19+00:00

18. Software_Engineer

Engineer_ID	Engineer_Name	Specialization	Programming_Skills	Projects_Handled	Employment_Start_Date
1	Malinde Choke	Game Development	Ruby	Digital Marketing Campaign Automation	2024-03-25T16:08:51+00:00
2	Loutitia Cresser	Cybersecurity	PHP	Digital Twin Simulation Tool	2024-0[illegible]-05T16:46:27+00:00
3	Mort Turle	Game Development	Go	Responsive Web Design Implementation	2024-04-18T09:27:43+00:00
4	Linzy Rumble	DevOps	JavaScript	IoT Device Connectivity Solution	2024-01-10T13:24:09+00:00
5	Mareah Hughland	Frontend Development	C#	Remote Workforce Collaboration Suite	2024-02-28T14:22:00+00:00
6	Phillip Dainter	Software Testing	Kotlin	Cybersecurity Threat Detection System	2024-05-30T00:20:31+00:00
7	Roley Orteau	Mobile Development	C#	Augmented Reality Experience Design	2024-03-02T15:59:28+00:00
8	Brittne Blenkinsopp	Cybersecurity	PHP	Remote Workforce Collaboration Suite	2024-01-24T05:17:08+00:00

9	Willy Wybrow	Software Testing	C++	Remote Workforce Collaboration Suite	2024-02-29T13:33:43+00:00
10	Cathe Eshelby	Full Stack Development	C#	Digital Twin Simulation Tool	2024-06-01T12:08:37+00:00
11	Cathryn McCart	Full Stack Development	Kotlin	Telehealth Platform Expansion	2024-05-31T21:35:56+00:00
12	Fulton White	Backend Development	Kotlin	Hospital Management System Revamp	2024-07-08T08:26:21+00:00
13	Lu Nutley	Machine Learning	PHP	Healthcare App Integration	2024-10-15T12:01:47+00:00
14	Boy Riddall	UI/UX Design	Scala	Online Payment Gateway Security Upgrade	2024-09-13T12:22:41+00:00
15	Tybalt Yacobsohn	Full Stack Development	Python	Energy Management System Upgrade	2023-11-20T17:55:05+00:00
16	Pincus Estable	Data Science	C++	Telehealth Platform Expansion	2024-06-20T11:37:02+00:00
17	Corette Renehan	Frontend Development	PHP	Natural Language Processing Toolkit Development	2024-07-18T20:27:46+00:00
18	Art Pendlington	Software Testing	TypeScript	Digital Twin Simulation Tool	2024-03-22T00:12:06+00:00
19	Pamela Josskoviz	Full Stack Development	Ruby	Bioinformatics Analysis Tool	2024-08-26T13:54:53+00:00

				Development	
20	Catherina Dring	Machine Learning	Rust	Customer Loyalty Program Software	2024-10-15T03:32:12+00:00
21	Gaylord Seymour	Full Stack Development	Swift	Project Management Tool Enhancement	2024-02-18T09:28:18+00:00
22	Doretta Linton	Machine Learning	C#	Project Management Tool Enhancement	2024-07-08T04:15:43+00:00
23	Moise Spawell	Full Stack Development	PHP	Project Management Tool Enhancement	2024-04-22T11:42:32+00:00
24	Maria MacLeese	DevOps	Go	Weather Forecasting Application Enhancement	2024-06-19T09:26:40+00:00
25	Chan Benn	Backend Development	PHP	Cloud-native Security Solutions Development	2024-10-07T05:48:20+00:00
26	Burke Sparkwill	Game Development	Dart	Logistics Tracking Software Enhancement	2024-08-06T11:55:17+00:00
27	Bibbie Stickley	Game Development	Rust	IoT Device Connectivity Solution	2024-08-06T08:54:17+00:00
28	Alon Kinkade	Data Science	Rust	Machine Learning Model Deployment	2024-01-29T15:54:36+00:00

29	Donni Wickson	Machine Learning	C++	Digital Twin Simulation Tool	2024-08-03T11:38:18+00:00
30	Bryan Skim	Embedded Systems	JavaScript	Digital Marketing Campaign Automation	2024-08-06T11:12:13+00:00
31	Ware Gendrich	Software Testing	Rust	HR Management System Security Update	2024-06-23T14:02:39+00:00
32	Frances Adolphine	Software Testing	PHP	Virtual Desktop Infrastructure Setup	2024-08-28T01:48:13+00:00
33	Ag Gencke	Database Administration	TypeScript	Social Media Platform Enhancement	2024-07-19T18:40:44+00:00
34	Joscelin Simondson	Backend Development	Kotlin	Cybersecurity Threat Detection System	2024-05-25T00:36:41+00:00
35	Nappy Assinder	Embedded Systems	JavaScript	Healthcare App Integration	2024-01-08T21:45:50+00:00
36	Paul Yakobowitch	Full Stack Development	JavaScript	Responsive Web Design Implementation	2023-12-31T15:11:59+00:00
37	Iseabal Johnsee	Software Testing	Scala	Supply Chain Optimization Software	2024-09-17T08:56:45+00:00
38	Jackson Winspar	Data Science	JavaScript	Energy Management System Upgrade	2023-12-31T11:52:08+00:00

39	Kassey Stonhard	Embedded Systems	Java	Geolocation Service Optimization	2023-12-11T22:32:38+00:00
40	Petronella Kellington	Cybersecurity	Ruby	Social Media Platform Enhancement	2024-07-09T21:19:37+00:00
41	Dante Batchellor	Mobile Development	Kotlin	IoT Device Connectivity Solution	2024-03-27T21:44:49+00:00
42	Tersina Erickson	Mobile Development	Objective-C	Cross-Platform Mobile App Creation	2024-06-12T17:41:36+00:00
43	Angelico Costain	Cybersecurity	Objective-C	Geolocation Service Optimization	2024-11-05T15:57:15+00:00
44	Rosalia Hance	Machine Learning	Java	AI-Powered Customer Support Bot	2023-12-26T20:48:24+00:00
45	Elfreda Cormack	Systems Programming	C#	IoT Device Connectivity Solution	2024-03-03T13:10:35+00:00
46	Broddy Kirkman	Systems Programming	Python	Weather Forecasting Application Enhancement	2023-11-20T12:39:52+00:00
47	Carlita Tessyman	Software Testing	Go	Cloud Infrastructure Automation	2024-04-15T05:45:10+00:00
48	Bret Scullin	DevOps	TypeScript	Virtual Desktop Infrastructure Setup	2024-07-21T12:28:16+00:00

49	Judd Loveman	Frontend Development	Swift	Digital Twin Simulation Tool	2024-05-04T08:37:41+00:00
50	Adriena Morant	Machine Learning	Go	CRM System Overhaul	2024-04-09T18:36:59+00:00
51	Abba Childes	Game Development	JavaScript	HR Management System Security Update	2023-12-27T13:11:11+00:00
52	Edie Tanti	UI/UX Design	C#	Smart Home Automation Integration	2024-02-27T21:38:58+00:00
53	Christoph Keady	Software Testing	Ruby	Augmented Reality Experience Design	2024-03-28T23:47:43+00:00
54	Sally Sutcliff	Cloud Computing	Go	Healthcare App Integration	2024-04-10T04:37:19+00:00
55	Gonzales Cruikshanks	Backend Development	JavaScript	Machine Learning Model Deployment	2023-12-30T09:16:24+00:00
56	Erny Barlee	Network Engineering	Ruby	Hospital Management System Revamp	2024-03-31T16:52:22+00:00
57	Milty Applin	Machine Learning	JavaScript	Project Management Tool Enhancement	2024-01-12T14:31:59+00:00

58	Merl Demonge	Cybersecurity	PHP	Open Source Contribution Management System	2024-06-20T17:47:22+00:00
59	Carmina Clougher	Full Stack Development	JavaScript	Cryptocurrency Wallet Implementation	2024-01-03T20:11:24+00:00
60	Wilmette Chaize	Database Administration	Objective-C	Project Management Tool Enhancement	2024-11-05T06:14:24+00:00
61	Gauthier Acutt	Machine Learning	Ruby	Social Media Platform Enhancement	2024-07-09T20:04:48+00:00
62	Bone Sara	Frontend Development	Objective-C	Virtual Reality Training Module	2024-03-19T15:56:11+00:00
63	Veda Broddle	Backend Development	PHP	AI-Powered Customer Support Bot	2024-10-29T13:20:30+00:00
64	Jess Brecken	Cloud Computing	C++	Energy Management System Upgrade	2024-06-18T21:45:38+00:00
65	Giuditta Livingstone	Cybersecurity	Python	Supply Chain Optimization Software	2024-01-27T15:16:22+00:00
66	Kelly Pyvis	Data Science	Java	Telehealth Platform Expansion	2023-11-21T07:18:26+00:00
67	Bourke Heenan	Machine Learning	Scala	Virtual Desktop	2023-12-10T18:55:45+00:00

				Infrastructure Setup	
68	Kiele Scohier	Full Stack Development	PHP	Cloud-native Security Solutions Development	2024-09-13T17:31:45+00:00
69	Travus Downs	Network Engineering	Rust	Project Management Tool Enhancement	2024-06-26T16:33:56+00:00
70	Jillayne Cornfield	Network Engineering	PHP	Smart Home Automation Integration	2024-08-06T09:27:06+00:00
71	Hillel Faraday	Systems Programming	TypeScript	Blockchain-based Supply Chain Management	2024-06-27T02:12:42+00:00
72	Moria Elverstone	Cybersecurity	PHP	Blockchain-based Supply Chain Management	2024-07-13T22:51:48+00:00
73	Zorana Cullimore	Frontend Development	Java	Interactive Game Development Platform	2024-06-19T03:18:24+00:00
74	Bernarr Gaskin	Full Stack Development	Rust	Cloud-native Security Solutions Development	2023-12-21T05:31:24+00:00
75	Leroi Lambertson	Embedded Systems	Java	Cross-Platform Mobile App Creation	2024-08-09T17:20:01+00:00

76	Madeline Ormond	Mobile Development	Ruby	Virtual Desktop Infrastructure Setup	2023-12-24T12:30:18+00:00
77	Halette Lundon	Frontend Development	Go	Data Analytics Dashboard Development	2024-03-12T17:52:32+00:00
78	Denna Devo	DevOps	Rust	Smart Home Automation Integration	2024-04-04T04:20:50+00:00
79	Arturo Collinwood	Game Development	TypeScript	Energy Management System Upgrade	2024-08-18T20:41:17+00:00
80	Loria Boughey	Mobile Development	Swift	Virtual Reality Training Module	2024-07-26T22:25:03+00:00
81	Tomi Bleacher	Cloud Computing	TypeScript	Robotic Process Automation Solution	2024-05-02T01:00:30+00:00
82	Mildrid Geekin	Systems Programming	Dart	Responsive Web Design Implementation	2024-07-20T15:43:31+00:00
83	Kory Marrett	Backend Development	Objective-C	Natural Language Processing Toolkit Development	2024-11-06T03:33:14+00:00
84	Flore Ogdahl	Cybersecurity	Scala	Energy Management System Upgrade	2024-08-30T13:19:35+00:00

85	Tedmund Lesor	Database Administration	Objective-C	IoT Device Connectivity Solution	2024-10-16T22:17:31+00:00
86	Kesley Gibbetts	Mobile Development	Dart	IoT Device Connectivity Solution	2024-10-02T07:23:55+00:00
87	Fredia Simmonds	UI/UX Design	Rust	Natural Language Processing Toolkit Development	2024-02-28T09:36:14+00:00
88	Elisha Armall	Network Engineering	C#	Bioinformatics Analysis Tool Development	2024-06-16T22:27:10+00:00
89	Milicent Beckhurst	Data Science	PHP	HR Management System Security Update	2024-02-04T10:59:21+00:00
90	Alaster Exelby	Cybersecurity	C++	Artificial Intelligence Ethics Toolkit	2023-12-09T07:14:27+00:00
91	Ferdy Oke	Database Administration	Java	Digital Marketing Campaign Automation	2024-01-31T02:14:17+00:00
92	Caritta Seary	Embedded Systems	C++	Satellite Data Processing Application	2024-08-16T20:43:00+00:00
93	Pavlov Ovett	Machine Learning	Rust	Hospital Management System Revamp	2024-08-27T17:55:53+00:00

94	Karel Agget	Full Stack Development	C#	Cross-Platform Mobile App Creation	2024-02-27T02:28:16+00:00
95	Grissel Lemme	Database Administration	Objective-C	Remote Workforce Collaboration Suite	2024-11-04T22:44:33+00:00
96	Patrizio Gut	DevOps	Python	Healthcare App Integration	2023-12-02T09:26:13+00:00
97	Yehudi Diegan	Network Engineering	JavaScript	Weather Forecasting Application Enhancement	2023-12-31T16:51:26+00:00
98	Blinny Jay	Game Development	TypeScript	Digital Twin Simulation Tool	2024-06-15T22:17:19+00:00
99	Gregoire Janaszkiewicz	Full Stack Development	Scala	Artificial Intelligence Toolkit	2024-07-27T20:46:57+00:00
100	Willette Scain	UI/UX Design	Swift	Open Source Contribution Management System	2024-09-17T13:25:44+00:00

19. Technology_Provider

Provider_ID	Provider_Name	Technology_Type	Location	Contact_Info	Partnership_Date	Service_Level
1	Smart Systems Corp.	Cloud Computing	2873 Chester Court, Honolulu, Hawaii, United States, 96845	+1 567 002 0063	2024-01-18T17:28:42+00:00	Basic
2	Tech Innovations Inc.	Internet of Things	5241 Bonneau Lane, Hot Springs National Park, Arkansas, United States, 71914	+1 276 041 0088	2024-03-16T02:13:47+00:00	Basic
3	Digital Solutions Ltd.	Artificial Intelligence	396 Balmoral Lane, Fayetteville, North Carolina, United States, 28305	+1 846 011 0052	2023-11-19T06:35:25+00:00	Enterprise
4	Tech Innovations Inc.	Augmented Reality	8517 Painter-Smith Lane, Sacramento, California, United States, 94263	+1 503 020 0055	2024-06-04T10:33:18+00:00	Premium
5	Pioneering Software LLC	Blockchain	1700 Queen Palm Place, Gilbert, Arizona,	+1 432 087 0021	2023-12-21T02:41:10+00:00	Basic

			United States, 85297			
6	NextGen Technologies	Artificial Intelligence	475 Delk Drive, Omaha, Nebraska, United States, 68110	+1 212 086 0073	2023-11-21T04:45:49+00:00	Gold
7	Tech Innovations Inc.	Augmented Reality	8810 Bolivar Street, Miami Beach, Florida, United States, 33141	+1 907 077 0053	2024-06-11T14:12:07+00:00	Standard
8	Digital Solutions Ltd.	Machine Learning	6283 Kaley Court, Fresno, California, United States, 93721	+1 436 056 0036	2024-04-10T22:26:58+00:00	Platinum
9	Futuristic Devices Co.	Data Analytics	4157 Berkeley Lane, Washington, District of Columbia, United States, 20046	+1 612 001 0080	2024-02-19T01:04:36+00:00	Standard
10	Quantum Tech Services	Cybersecurity	971 Rosales Road, Phoenix, Arizona, United States, 85067	+1 871 064 0021	2023-12-03T07:11:43+00:00	Enterprise
11	Digital Solutions Ltd.	Artificial Intelligence	3029 Napa Lane, El Paso, Texas, United States, 79950	+1 208 038 0009	2024-01-22T12:56:58+00:00	Gold
12	NextGen Technologies	Blockchain	623 Lockwood Loop, Cleveland, Ohio, United States, 44191	+1 646 085 0009	2023-11-24T19:32:13+00:00	Premium
13	CloudTech Providers	Software Development	1729 Williams Road, New York City, New York, United States, 10292	+1 746 061 0050	2023-12-21T19:13:42+00:00	Gold
14	Quantum Tech Services	5G Technology	12709 Eastpoint Street, Lima, Ohio, United States, 45807	+1 452 089 0094	2024-09-14T17:40:55+00:00	Platinum

15	Digital Solutions Ltd.	5G Technology	10439 Sheldon Terrace, Arvada, Colorado, United States, 80005	+1 462 087 0017	2024-07-21T08:22:28+00:00	Silver
16	AI Global Solutions	Cloud Computing	9991 Ridgeville Road, Washington, District of Columbia, United States, 20088	+1 288 012 0017	2024-07-10T10:07:53+00:00	Bronze
17	Pioneering Software LLC	Cybersecurity	10618 Carrera Drive, Southfield, Michigan, United States, 48076	+1 349 027 0027	2024-01-07T21:54:43+00:00	Enterprise
18	NextGen Technologies	Quantum Computing	2430 Mead Place, San Diego, California, United States, 92170	+1 698 056 0084	2024-01-23T20:55:18+00:00	Silver
19	AI Global Solutions	DevOps	3084 Tooke Terrace, Sparks, Nevada, United States, 89436	+1 132 088 0046	2024-05-12T05:04:05+00:00	Basic
20	Pioneering Software LLC	Virtual Reality	7565 Zeeland Terrace, Houston, Texas, United States, 77050	+1 941 014 0011	2024-08-08T15:39:26+00:00	Silver
21	NextGen Technologies	Mobile Applications	11189 Nicole Terrace, Louisville, Kentucky, United States, 40210	+1 903 079 0026	2023-12-27T06:15:47+00:00	Standard
22	CloudTech Providers	Machine Learning	1952 Nordic Lane, New York City, New York, United States, 10270	+1 941 017 0095	2024-06-24T14:14:02+00:00	Gold
23	Digital Solutions Ltd.	Cybersecurity	9343 Berkeley Lane, Gainesville, Florida, United States, 32627	+1 643 094 0049	2024-09-23T20:56:15+00:00	Gold

24	Vertex Digital Corporation	Virtual Reality	13083 Botello Avenue, Hicksville, New York, United States, 11854	+1 256 026 0017	2024-04-15T23:42:29+00:00	Basic
25	Pioneering Software LLC	Machine Learning	6490 Winterthur Loop, Boston, Massachusetts, United States, 02124	+1 012 031 0017	2024-07-09T20:55:23+00:00	Enterprise
26	Quantum Tech Services	Mobile Applications	9969 Fry Terrace, Houston, Texas, United States, 77005	+1 002 038 0072	2024-02-10T02:13:09+00:00	Platinum
27	NextGen Technologies	Cybersecurity	3790 Mountville Court, Washington, District of Columbia, United States, 20299	+1 626 016 0079	2024-07-02T07:13:25+00:00	Gold
28	Tech Innovations Inc.	Quantum Computing	9659 Churchill Downs, Jefferson City, Missouri, United States, 65110	+1 120 037 0050	2024-04-26T08:18:55+00:00	Enterprise
29	AI Global Solutions	Blockchain	6915 Burtoft Lane, Sacramento, California, United States, 94245	+1 281 033 0078	2024-09-22T02:32:21+00:00	Gold
30	AI Global Solutions	Quantum Computing	13011 Horizon Run, Charleston, South Carolina, United States, 29424	+1 145 085 0018	2024-01-26T07:22:44+00:00	Basic
31	AI Global Solutions	DevOps	3184 Cowardin Court, Spring, Texas, United States, 77388	+1 702 047 0085	2024-05-21T05:39:28+00:00	Platinum
32	Tech Innovations Inc.	Mobile Applications	7935 Rischitelli Place, Battle Creek, Michigan, United States, 49018	+1 186 035 0079	2023-12-20T14:48:27+00:00	Premium

33	NextGen Technologies	Quantum Computing	1680 Rivera Road, Lincoln, Nebraska, United States, 68524	+1 237 058 0071	2024-05-05T03:44:24+00:00	Silver
34	CloudTech Providers	Augmented Reality	7276 Beville Place, Charlotte, North Carolina, United States, 28272	+1 179 007 0091	2024-08-19T10:17:14+00:00	Bronze
35	AI Global Solutions	Augmented Reality	11631 Woodbreeze Place, Louisville, Kentucky, United States, 40280	+1 378 048 0033	2024-10-07T02:00:18+00:00	Enterprise
36	NextGen Technologies	Machine Learning	13625 Lucas Court, Modesto, California, United States, 95354	+1 960 093 0020	2024-05-05T23:21:54+00:00	Bronze
37	Futuristic Devices Co.	Blockchain	7309 Harvey Lane, Pittsburgh, Pennsylvania, United States, 15240	+1 722 099 0039	2024-06-10T18:43:04+00:00	Silver
38	AI Global Solutions	DevOps	8777 Wentrop Avenue, Hartford, Connecticut, United States, 06160	+1 609 009 0041	2024-06-02T22:45:16+00:00	Basic
39	Vertex Digital Corporation	Cloud Computing	8456 Lisette Way, Clearwater, Florida, United States, 33763	+1 019 059 0059	2024-04-17T12:09:04+00:00	Premium
40	Tech Innovations Inc.	Cybersecurity	6552 Wimberly Place, Mobile, Alabama, United States, 36628	+1 255 006 0090	2023-12-13T02:53:05+00:00	Standard
41	AI Global Solutions	Augmented Reality	1373 Leisure Street, Las Vegas, Nevada, United States, 89125	+1 524 068 0015	2024-08-14T14:40:34+00:00	Premium

42	Quantum Tech Services	Artificial Intelligence	11433 Faith Terrace, Sioux Falls, South Dakota, United States, 57105	+1 415 019 0040	2024-01-18T02:34:40+00:00	Standard
43	CloudTech Providers	Virtual Reality	2848 Ironton Place, Denver, Colorado, United States, 80228	+1 513 035 0033	2024-02-05T07:57:45+00:00	Enterprise
44	Vertex Digital Corporation	DevOps	3595 Donalds Place, Flushing, New York, United States, 11355	+1 403 088 0044	2024-06-13T05:04:56+00:00	Bronze
45	Pioneering Software LLC	Cloud Computing	8876 Cedar Waxwing Drive, Jamaica, New York, United States, 11499	+1 529 060 0002	2023-11-16T05:15:33+00:00	Bronze
46	Pioneering Software LLC	Virtual Reality	271 Waterloo Way, Washington, District of Columbia, United States, 20220	+1 901 000 0035	2024-06-21T03:23:45+00:00	Bronze
47	Futuristic Devices Co.	Mobile Applications	9201 Heath Springs Drive, Charlotte, North Carolina, United States, 28205	+1 975 086 0082	2024-08-22T06:59:35+00:00	Standard
48	Pioneering Software LLC	Virtual Reality	11748 Erica Chambers Avenue, Albany, New York, United States, 12255	+1 636 015 0075	2024-01-14T04:34:30+00:00	Silver
49	Tech Innovations Inc.	Artificial Intelligence	2687 Gates Lane, Wilmington, Delaware, United States, 19892	+1 992 083 0009	2024-07-01T16:15:52+00:00	Platinum
50	Digital Solutions Ltd.	Internet of Things	9633 Hillcrest Drive, Peoria, Illinois, United States, 61605	+1 318 064 0036	2024-09-23T22:48:09+00:00	Bronze

51	Pioneering Software LLC	Cybersecurity	13087 Mclin Lane, Charlotte, North Carolina, United States, 28278	+1 078 002 0074	2024-07-03T14:19:55+00:00	Premium
52	NextGen Technologies	Augmented Reality	9712 Polacheck Place, El Paso, Texas, United States, 79999	+1 823 087 0098	2023-11-19T18:51:00+00:00	Standard
53	Smart Systems Corp.	Virtual Reality	417 Sanderling Street, Spokane, Washington, United States, 99252	+1 176 082 0080	2024-03-28T01:37:43+00:00	Gold
54	AI Global Solutions	Cybersecurity	5715 Jenks Court, Kent, Washington, United States, 98042	+1 716 026 0037	2024-01-24T20:41:44+00:00	Standard
55	Digital Solutions Ltd.	Internet of Things	3125 Branham Street, North Little Rock, Arkansas, United States, 72199	+1 344 033 0048	2024-05-31T19:25:28+00:00	Platinum
56	Pioneering Software LLC	Augmented Reality	8368 Endsley Court, Las Vegas, Nevada, United States, 89140	+1 912 037 0079	2024-06-26T10:30:22+00:00	Platinum
57	NextGen Technologies	Software Development	9418 Kearns Corner, Lancaster, Pennsylvania, United States, 17605	+1 074 087 0098	2024-03-28T04:39:28+00:00	Silver
58	Digital Solutions Ltd.	Virtual Reality	3491 Lancaster Lane, Minneapolis, Minnesota, United States, 55487	+1 552 055 0010	2024-06-03T05:10:08+00:00	Bronze
59	CloudTech Providers	E-commerce Solutions	5720 Skipper Street, Orlando, Florida, United States, 32859	+1 580 004 0025	2024-09-16T02:37:44+00:00	Gold

60	Vertex Digital Corporation	E-commerce Solutions	8467 Norman Run, Memphis, Tennessee, United States, 38181	+1 448 026 0061	2024-07-03T07:57:39+00:00	Silver
61	Digital Solutions Ltd.	Artificial Intelligence	12765 Fenster Lane, Salt Lake City, Utah, United States, 84199	+1 720 014 0023	2024-10-30T07:53:28+00:00	Gold
62	Vertex Digital Corporation	Virtual Reality	9701 Enrique Drive, Louisville, Kentucky, United States, 40256	+1 358 029 0028	2024-10-26T07:36:52+00:00	Standard
63	AI Global Solutions	DevOps	14577 Abel Place, San Antonio, Texas, United States, 78205	+1 078 023 0016	2023-11-20T16:34:06+00:00	Gold
64	Digital Solutions Ltd.	Quantum Computing	14413 Welcome Way, New Orleans, Louisiana, United States, 70165	+1 861 019 0019	2024-06-21T17:56:21+00:00	Premium
65	CloudTech Providers	Data Analytics	454 Rayma Place, Dallas, Texas, United States, 75236	+1 399 042 0070	2024-08-08T23:00:56+00:00	Premium
66	Quantum Tech Services	Mobile Applications	9226 Avon Loop, Cleveland, Ohio, United States, 44177	+1 172 070 0033	2024-05-16T07:28:47+00:00	Silver
67	CloudTech Providers	Machine Learning	11202 Buttercup Way, Houston, Texas, United States, 77045	+1 667 077 0095	2024-02-22T10:31:48+00:00	Silver
68	Vertex Digital Corporation	Mobile Applications	7733 Strawbridge Street, Boston, Massachusetts, United States, 02216	+1 517 079 0075	2024-08-27T19:35:51+00:00	Premium
69	Smart Systems Corp.	Machine Learning	4296 Wales Plaza, Aiken, South Carolina,	+1 786 000 0053	2024-04-17T04:04:46+00:00	Basic

			United States, 29805			
70	Smart Systems Corp.	Software Development	11975 Allison Place, Montgomery, Alabama, United States, 36114	+1 889 005 0050	2024-04-23T10:00:46+00:00	Gold
71	AI Global Solutions	Machine Learning	13839 Pelham Avenue, Raleigh, North Carolina, United States, 27615	+1 565 067 0042	2024-09-08T23:52:39+00:00	Bronze
72	Vertex Digital Corporation	5G Technology	6539 Nicksic Court, San Bernardino, California, United States, 92405	+1 785 093 0010	2024-04-26T04:06:29+00:00	Enterprise
73	Smart Systems Corp.	Mobile Applications	13492 Mcdowell Drive, New Orleans, Louisiana, United States, 70174	+1 198 024 0055	2024-07-21T01:30:36+00:00	Basic
74	Vertex Digital Corporation	DevOps	6795 Chesnee Place, Panama City, Florida, United States, 32405	+1 614 049 0046	2024-09-23T17:13:57+00:00	Gold
75	AI Global Solutions	Artificial Intelligence	12474 Phillips Court, Colorado Springs, Colorado, United States, 80925	+1 493 079 0009	2024-04-27T01:29:49+00:00	Standard
76	Digital Solutions Ltd.	Augmented Reality	6907 Filone Lane, Boca Raton, Florida, United States, 33499	+1 974 052 0043	2024-08-18T08:14:31+00:00	Gold
77	Smart Systems Corp.	Blockchain	10427 Dandrea Place, Aurora, Illinois, United States, 60505	+1 248 014 0089	2024-06-06T19:17:58+00:00	Standard
78	NextGen Technologies	Machine Learning	13077 Brooks Avenue, Miami, Florida, United States, 33180	+1 436 067 0045	2023-12-24T04:45:05+00:00	Gold

79	NextGen Technologies	Data Analytics	6944 Dynasty Place, Cedar Rapids, Iowa, United States, 52405	+1 721 038 0046	2024-04-23T14:09:28+00:00	Basic
80	Quantum Tech Services	Cloud Computing	11586 Anthony Terrace, Las Vegas, Nevada, United States, 89105	+1 613 052 0025	2024-02-23T08:57:54+00:00	Enterprise
81	Futuristic Devices Co.	Cybersecurity	320 Lance Court, Houston, Texas, United States, 77055	+1 212 082 0030	2024-01-09T23:38:51+00:00	Enterprise
82	Futuristic Devices Co.	Internet of Things	8614 Freitag Avenue, Huntington, West Virginia, United States, 25775	+1 284 045 0073	2024-02-03T17:09:47+00:00	Standard
83	Pioneering Software LLC	Data Analytics	1827 Arnett Avenue, San Diego, California, United States, 92170	+1 580 030 0087	2024-03-22T12:29:39+00:00	Gold
84	Smart Systems Corp.	Internet of Things	6802 Kanawha Place, Wichita, Kansas, United States, 67210	+1 359 045 0052	2024-02-17T10:47:24+00:00	Enterprise
85	Tech Innovations Inc.	Virtual Reality	4334 Pope Place, Wilmington, Delaware, United States, 19892	+1 705 024 0091	2024-03-16T19:31:56+00:00	Premium
86	Smart Systems Corp.	Mobile Applications	2515 Motz Terrace, Fayetteville, North Carolina, United States, 28314	+1 051 063 0024	2024-06-20T08:27:17+00:00	Enterprise
87	NextGen Technologies	Machine Learning	3528 Culvert Court, Columbus, Ohio, United States, 43226	+1 907 053 0013	2024-09-24T01:21:00+00:00	Silver

88	AI Global Solutions	Cybersecurity	5487 La Posada Drive, Pasadena, Texas, United States, 77505	+1 729 025 0096	2024-11-08T23:04:57+00:00	Platinum
89	Futuristic Devices Co.	Augmented Reality	4091 Trailwinds Terrace, Houston, Texas, United States, 77255	+1 163 098 0009	2023-12-27T03:23:18+00:00	Basic
90	Tech Innovations Inc.	5G Technology	5254 Mangrove Lane, Fresno, California, United States, 93762	+1 803 088 0051	2024-04-12T04:40:34+00:00	Bronze
91	AI Global Solutions	Mobile Applications	9169 Lisbon Lane, Raleigh, North Carolina, United States, 27605	+1 533 061 0029	2024-02-02T22:43:17+00:00	Standard
92	Quantum Tech Services	Mobile Applications	13091 Cipriano Place, Lincoln, Nebraska, United States, 68583	+1 367 067 0032	2024-06-04T16:32:03+00:00	Silver
93	Vertex Digital Corporation	Blockchain	14972 Fairfax Terrace, San Francisco, California, United States, 94110	+1 178 024 0015	2024-07-22T11:33:05+00:00	Gold
94	Quantum Tech Services	Augmented Reality	1948 Atwell Avenue, Huntington, West Virginia, United States, 25705	+1 072 089 0060	2024-10-03T00:18:45+00:00	Standard
95	Digital Solutions Ltd.	Augmented Reality	6335 Blythill Lane, Pittsburgh, Pennsylvania, United States, 15261	+1 856 039 0031	2024-09-27T17:07:23+00:00	Silver
96	AI Global Solutions	Mobile Applications	3497 Nehaul Terrace, Seattle, Washington, United States, 98109	+1 471 000 0045	2023-12-04T02:18:27+00:00	Silver

97	AI Global Solutions	E-commerce Solutions	8527 Nostalgia Terrace, Duluth, Minnesota, United States, 55805	+1 087 000 0038	2024-06-06T11:12:24+00:00	Standard
98	Tech Innovations Inc.	DevOps	10486 Arthur Place, Tyler, Texas, United States, 75710	+1 460 008 0004	2024-06-11T04:44:37+00:00	Enterprise
99	Pioneering Software LLC	E-commerce Solutions	13458 Ashgrove Terrace, Miami, Florida, United States, 33169	+1 473 024 0089	2024-09-28T10:36:31+00:00	Enterprise
100	Digital Solutions Ltd.	Quantum Computing	13241 Budny Avenue, San Jose, California, United States, 95118	+1 836 076 0066	2023-12-28T07:46:58+00:00	Bronze

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Meaning of Data

To ensure that the generated data is both meaningful and practical for our greenhouse management system, we have carefully configured Mockaroo's data generation settings to fit each field type across various tables. This approach guarantees realistic data that accurately reflects the relationships and functionality needed for robust testing.

1. **Row Number**
   The ID field for each table uses a unique, sequential row number, providing clarity and distinctness to each record. This approach ensures consistency across primary key fields such as `User_ID`, `Greenhouse_ID`, and `Sensor_ID`, maintaining clear identification and enabling smooth data referencing.
2. **Date-Time**
   Date-related fields, such as `Last_Training_Date` in the `AI_Model` table or `Date_Performed` in the `Maintenance_Record` table, use Mockaroo's Date and Time types. For fields requiring precise timestamps (e.g., `Timestamp` in the `Data` table and `Generated_Date` in the `Alert` table), Ruby-based formulas are used to simulate realistic timing patterns, providing accurate and logical time-based data points.
3. **Custom List**
   Mockaroo's Custom List functionality is utilized for fields with predefined values, such as status or condition fields. For example, `Sensor_Status` in the `IoT_Sensor` table or `Status` in the `Greenhouse` table uses this feature to assign values like "Active," "Inactive," or "Under Maintenance." This ensures that all status fields follow consistent, real-world scenarios.
4. **Dataset Column**
   The Dataset Column feature is used to accurately simulate foreign key relationships between tables. By linking tables through these columns, we ensure that data dependencies reflect the structure of the database. For instance, fields such as `Greenhouse_ID` in the `IoT_Sensor` table or `Owner_ID` in the `Greenhouse` table use Dataset Columns to maintain accurate relational integrity.
5. **Formula**
   Mockaroo's Formula feature provides flexibility for creating data that requires specific calculations or custom values. For instance, fields like `Accuracy` in the `AI_Model` table or `Current_Value` in the `Climate_Condition` table use formulas to generate values that fit realistic ranges and dependencies. This adds another layer of authenticity to the dataset.
6. **Other**
   Mockaroo offers a variety of additional data types that we use for specific field requirements, including `Number`, `Phone`, `Email`, and `Username` fields. By configuring these options carefully across tables like `User`, `Technology_Provider`, and `Environmental_Researcher`, we ensure that the generated data is both varied and contextually relevant. Each field configuration is designed to produce data that aligns closely with the greenhouse management system's operational requirements.

By rigorously applying these data generation settings, we have created a dataset that is rich in realism, maintaining the structural and relational integrity necessary to effectively test and develop our greenhouse management application.

🔍Use Cases (Query)

Overview

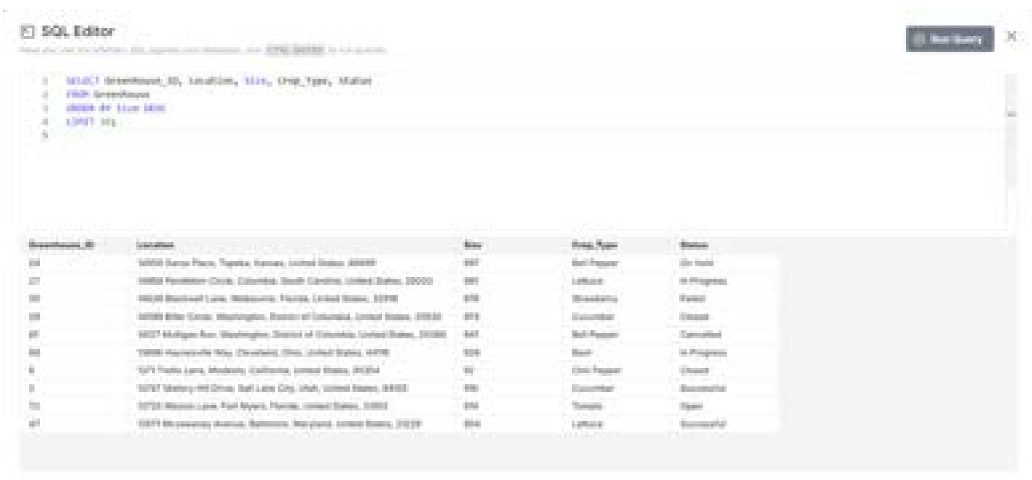
This document provides 12 detailed real-life use case scenarios along with their corresponding SQL queries, designed to help stakeholders, administrators, and data analysts gain meaningful insights into greenhouse operations and management. These use cases cover a wide range of business needs, from user management and greenhouse monitoring to technology provider evaluation and alert analysis.

1. Top 10 Greenhouses by Size

Scenario: The management team wants to identify the largest greenhouses in terms of physical size to plan resource allocation effectively and ensure optimal distribution of technology and personnel.

- **Purpose**: Helps prioritize maintenance and technology investments in larger facilities.
- **Query**:

```sql
SELECT Greenhouse_ID, Location, Size, Crop_Type
FROM Greenhouse
ORDER BY Size DESC
LIMIT 10;
```



2. Sensors Installed in a Specific Greenhouse

Scenario: The operations team needs to view all sensors installed in a specific greenhouse to plan maintenance schedules and monitor the status of different sensors.

- **Purpose**: Facilitates efficient sensor management and helps prioritize sensor maintenance and upgrades.
- **Query**:

```sql
SELECT Sensor_ID, Sensor_Type, Installation_Date, Sensor_Status
FROM IoT_Sensor
WHERE Greenhouse_ID = 71; -- Replace with the desired Greenhouse_ID
```

3. Greenhouses Managed by a Specific User

Scenario: Stakeholders require a list of all greenhouses managed by a specific user to ensure proper oversight and management of greenhouse operations.

- **Purpose**: Ensures that management responsibilities are clear and helps with task allocation and performance evaluation.
- **Query**:

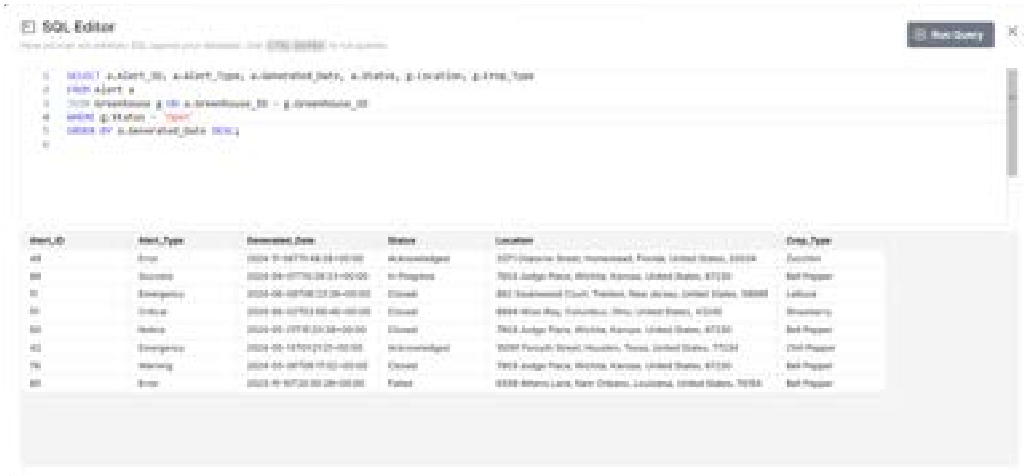
```sql
SELECT Greenhouse_ID, Location, Size, Crop_Type, Status
FROM Greenhouse
WHERE Owner_ID = (SELECT User_ID FROM User WHERE Email = 'user@example.com'); -- Replace with the specific user email
```

4. Recent Alerts for Active Greenhouses

Scenario: The management team needs a report on recent alerts from active greenhouses to identify urgent issues and take immediate action.

- **Purpose**: Improves issue resolution and ensures proactive monitoring and response to potential problems.
- **Query**:

```sql
SELECT a.Alert_ID, a.Alert_Type, a.Generated_Date, a.Status, g.Location, g.Crop_Type
FROM Alert a
JOIN Greenhouse g ON a.Greenhouse_ID = g.Greenhouse_ID
WHERE g.Status = 'Open'
ORDER BY a.Generated_Date DESC;
```



5. Maintenance Records for a Specific Period

Scenario: The operations team needs to track maintenance activities performed during a specific timeframe for performance reviews and planning.

- **Purpose**: Provides insights into maintenance frequency and efficiency and helps in auditing and resource allocation.
- **Query**:

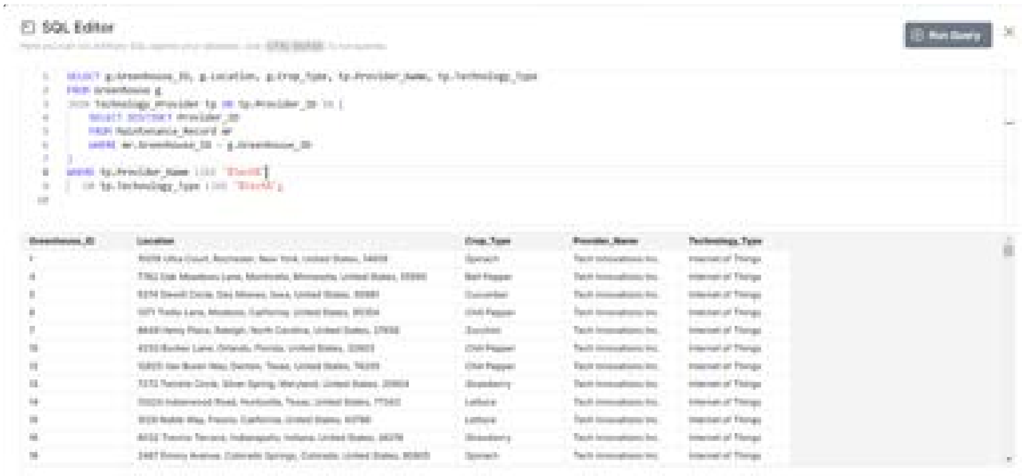
```sql
SELECT Maintenance_ID, Date_Performed, Task_Description, User_ID, Sensor_ID
FROM Maintenance_Record
WHERE Date_Performed BETWEEN '2024-01-01' AND '2024-12-31'; -- Replace with the desired date range
```

6. Greenhouses Using Specific Technology Providers

Scenario: Management wants to know which greenhouses are supported by certain technology providers for performance analysis and strategic partnerships.

- **Purpose**: Assists in evaluating the effectiveness of technology partnerships and aligning technology adoption strategies.
- **Query**:

```sql
SELECT g.Greenhouse_ID, g.Location, g.Crop_Type, tp.Provider_Name, tp.Technology_Type
FROM Greenhouse g
JOIN Technology_Provider tp ON tp.Provider_ID IN (
    SELECT DISTINCT Provider_ID
    FROM Maintenance_Record mr
    WHERE mr.Greenhouse_ID = g.Greenhouse_ID
)
WHERE tp.Provider_Name LIKE '%Tech%'
   OR tp.Technology_Type LIKE '%Tech%';
```



7. AI Models and Their Accuracy

Scenario: The IT department requires a list of AI models and their accuracy to evaluate performance and determine which models need retraining.

- **Purpose**: Helps in maintaining high-performing AI models and optimizing greenhouse management.
- **Query**:

```sql
SELECT Model_ID, Model_Type, Version, Last_Training_Date, Accuracy
FROM AI_Model
ORDER BY Accuracy DESC;
```

8. Active Sensors by Greenhouse

Scenario: The technical team requires a summary of active sensors in each greenhouse to conduct a sensor health audit and plan for future maintenance.

- **Purpose**: Ensures that all active sensors are functional and monitored regularly.
- **Query**:

```sql
SELECT g.Greenhouse_ID, g.Location, COUNT(s.Sensor_ID) AS Active_Sensor_Count
FROM Greenhouse g
JOIN IoT_Sensor s ON g.Greenhouse_ID = s.Greenhouse_ID
WHERE s.Sensor_Status = 'Active'
GROUP BY g.Greenhouse_ID, g.Location;
```

9. Actuators Linked to Control Systems

Scenario: The technical team needs to see which actuators are linked to which control systems to ensure proper setup and configuration.

- **Purpose**: Supports system checks and helps in identifying misconfigurations or necessary adjustments.
- **Query**:

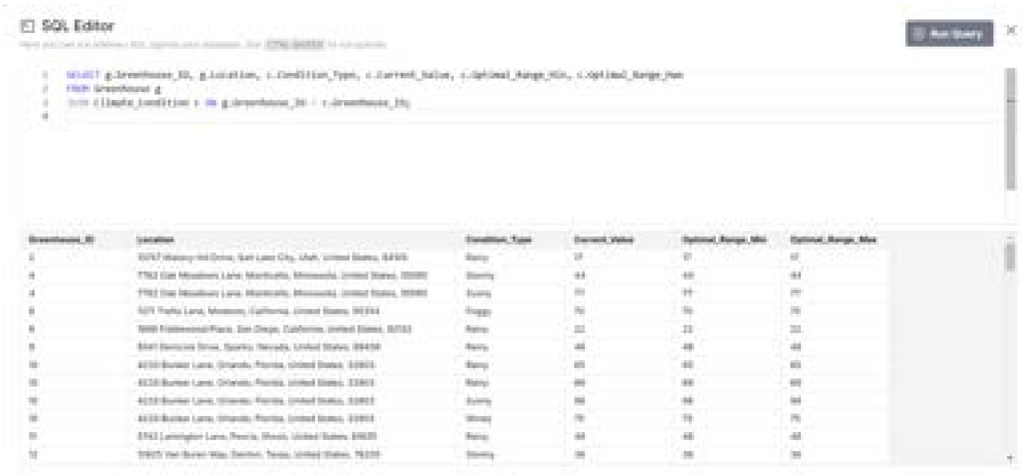
```sql
SELECT a.Actuator_ID, a.Actuator_Type, cs.Control_Type, g.Location
FROM Actuator a
JOIN Control_System cs ON a.Control_ID = cs.Control_ID
JOIN Greenhouse g ON cs.Greenhouse_ID = g.Greenhouse_ID;
```

10. Summary of Environmental Conditions in Greenhouses

Scenario: Management requires a quick overview of the current environmental conditions in all greenhouses to make data-driven decisions.

- **Purpose**: Helps with quick assessments and adjustment planning for optimal greenhouse conditions.
- **Query**:

```sql
SELECT g.Greenhouse_ID, g.Location, c.Condition_Type, c.Current_Value,
c.Optimal_Range_Min, c.Optimal_Range_Max
FROM Greenhouse g
JOIN Climate_Condition c ON g.Greenhouse_ID = c.Greenhouse_ID;
```

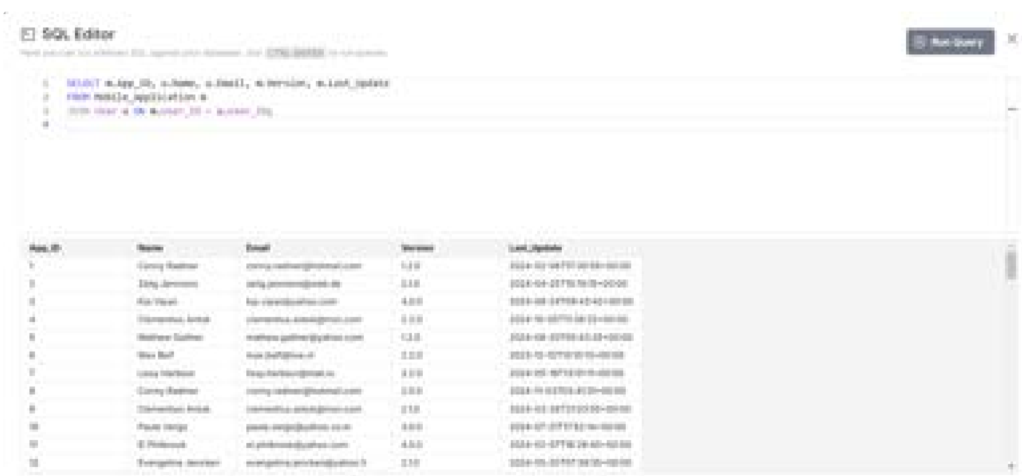


11. User Access with Mobile Applications

Scenario: Stakeholders want a report on users who have accessed the system through mobile applications to understand engagement levels.

- **Purpose**: Provides insights into user behavior and helps track system usage.
- **Query**:

```sql
SELECT m.App_ID, u.Name, u.Email, m.Version, m.Last_Update
FROM Mobile_Application m
JOIN User u ON m.User_ID = u.User_ID;
```

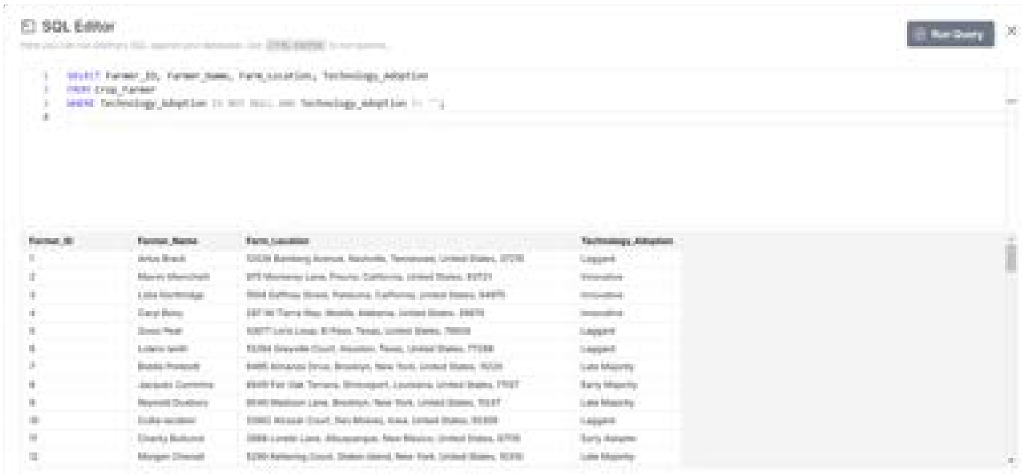


12. Farmers and Their Technological Adoption

Scenario: The company needs to identify farmers who are adopting advanced technology for planning and reporting purposes.

- **Purpose**: Supports strategic planning and helps understand the extent of technology adoption among users.
- **Query**:

```sql
SELECT Farmer_ID, Farmer_Name, Farm_Location, Technology_Adoption
FROM Crop_Farmer
WHERE Technology_Adoption IS NOT NULL AND Technology_Adoption != '';
```



Conclusion

This document provides a comprehensive set of use cases and SQL queries tailored to the greenhouse management system's operational and strategic needs. Each use case addresses specific business scenarios, such as managing user access, monitoring environmental conditions, and evaluating technology partnerships, which are critical for effective greenhouse management and decision-making.

The queries are designed to offer targeted insights for stakeholders, administrators, and data analysts by extracting meaningful data from the database. By leveraging these queries, the management team can make informed decisions, optimize resource allocation, maintain operational efficiency, and enhance the system's overall performance.

Additionally, indexing and optimization techniques were applied where necessary to ensure that the queries perform efficiently, especially when dealing with large datasets and complex filtering. This indexing strategy minimizes full table scans and enhances data retrieval speed, ensuring the system can handle real-time data analysis without compromising performance.

In conclusion, these SQL queries serve as powerful tools for managing greenhouse operations, enhancing monitoring capabilities, and providing actionable insights. Regular review and adjustments of these queries will be essential as the system evolves, ensuring continued alignment with business goals and operational requirements. This document establishes a strong foundation for leveraging data-driven insights in greenhouse management and supports scalability and future expansion as the system and data needs grow.

Index Implementation for Enhanced Performance

Overview

This section outlines an indexing strategy tailored to the specific query requirements of the greenhouse management system. The purpose of indexing is to enhance query performance, minimize full table scans, and improve data retrieval speed. Below, we detail index creation for various queries used in the system, explain their performance benefits, and provide insights for ongoing performance monitoring.

1. Top Greenhouses by Size

Creating an index on the `Size` and `Location` columns in the `Greenhouse` table can improve sorting and retrieval speeds.

Index Creation:

```
CREATE INDEX idx_greenhouse_size ON Greenhouse (Size, Location);
```

Performance Check: The EXPLAIN plan indicates a full table scan (type = ALL) on the `Greenhouse` table, as shown by the lack of possible keys. This results in the use of a filesort operation for ordering.

Your SQL query has been executed successfully.

EXPLAIN SELECT Greenhouse_ID, Location, Size, Crop_Type FROM Greenhouse ORDER BY Size DESC LIMIT 10;

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	Greenhouse	ALL	NULL	NULL	NULL	NULL	100	Using filesort

Conclusion: Since the query sorts by the `Size` column, an index on this column (e.g., `idx_greenhouse_size`) would help optimize performance by reducing the need for filesort and making the sorting operation more efficient.

2. Sensors Installed in a Specific Greenhouse

To optimize queries that filter by `Greenhouse_ID`, an index on the `IoT_Sensor` table is needed.

Index Creation:

```
CREATE INDEX idx_sensor_greenhouse ON IoT_Sensor (Greenhouse_ID, Sensor_ID);
```

Performance Check: The query utilizes the index `idx_sensor_greenhouse`, as shown by the `ref` type, which filters based on `Greenhouse_ID`. This index effectively reduces the rows scanned, optimizing performance.

Conclusion: The query execution plan is efficient as it leverages the index to filter by `Greenhouse_ID`. No additional indexes are needed for optimization in this case.

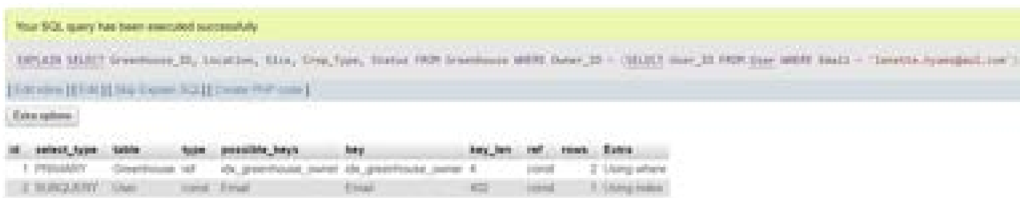
3. Greenhouses Managed by a Specific User

Adding an index to `Owner_ID` in the `Greenhouse` table improves performance when filtering by the user's ID.

Index Creation:

```
CREATE INDEX idx_greenhouse_owner ON Greenhouse (Owner_ID);
```

Performance Check: The query uses the `idx_greenhouse_owner` index on `Greenhouse.Owner_ID` and `User.Email` for the subquery. The `Using where` and `Using index` operations indicate that the indexes are effectively utilized.



Conclusion: This query is optimized as it effectively uses indexes for both filtering and joining, reducing the need for a full scan on the `Greenhouse` table.

4. Recent Alerts for Active Greenhouses

An index on the `Generated_Date` and `Greenhouse_ID` columns in the `Alert` table is beneficial for retrieving recent alerts.

Index Creation:

```
CREATE INDEX idx_alert_date_greenhouse ON Alert (Generated_Date, Greenhouse_ID);
```

Performance Check: The EXPLAIN plan shows a full table scan on the `Alert` table and uses the primary key on the `Greenhouse` table. However, it still requires filesort for ordering by `Generated_Date`.

Conclusion: Adding an index on `Generated_Date` (e.g., `idx_alert_generated_date`) would enhance performance by eliminating the filesort and expediting sorting on this column.

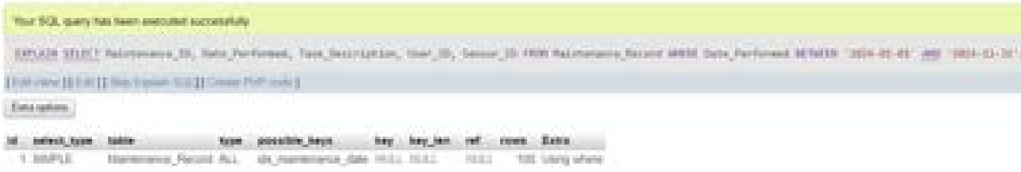
5. Maintenance Records for a Specific Period

Creating an index on the `Date_Performed` column in the `Maintenance_Record` table speeds up date range queries.

Index Creation:

```sql
CREATE INDEX idx_maintenance_date ON Maintenance_Record (Date_Performed);
```

Performance Check: The query uses the index `idx_maintenance_date` for filtering by `Date_Performed`. The `Using where` indicates that the index helps filter rows within the specified date range.



Conclusion: The query is efficient as it leverages the `Date_Performed` index to filter data. This index enables efficient date-based filtering without needing a full table scan.

6. Greenhouses Using Specific Technology Providers

An index on `Provider_ID` in the `Technology_Provider` and `Greenhouse_ID` in the `Maintenance_Record` table helps in queries involving subqueries and joins.

Index Creation:

```sql
CREATE INDEX idx_tech_provider ON Technology_Provider (Provider_ID);
CREATE INDEX idx_maintenance_greenhouse ON Maintenance_Record (Greenhouse_ID, User_ID);
```

Performance Check: The query uses `idx_maintenance_greenhouse` to filter by `Greenhouse_ID` in the `Maintenance_Record` table. Temporary tables and join buffers are used for intermediate operations, which suggests room for optimization.

Conclusion: Indexing `Technology_Provider.Provider_Name` and `Technology_Provider.Technology_Type` would help improve performance by reducing temporary table and buffer usage. Additional indexes may help if specific technology filtering is frequent.

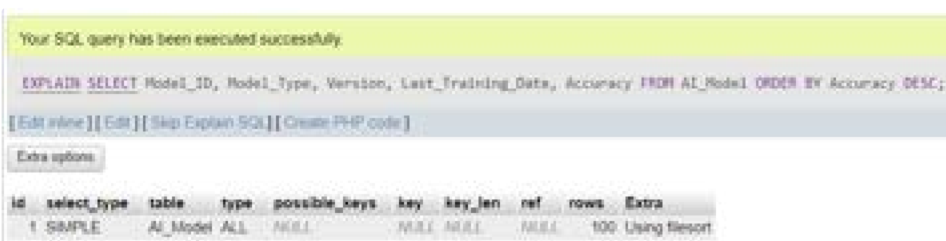
7. AI Models and Their Accuracy

An index on the `Accuracy` and `Model_Type` columns in the `AI_Model` table enhances sorting and filtering performance.

Index Creation:

```sql
CREATE INDEX idx_ai_model_accuracy ON AI_Model (Accuracy, Model_Type);
```

Performance Check: The query performs a full table scan on the `AI_Model` table and uses a filesort to order by `Accuracy`.



Conclusion: An index on `Accuracy` (e.g., `idx_ai_model_accuracy`) would improve performance by allowing direct ordering, eliminating the filesort operation.

8. Active Sensors by Greenhouse

An index on the `Greenhouse_ID` and `Sensor_Status` columns in the `IoT_Sensor` table facilitates counting active sensors.

Index Creation:

```
CREATE INDEX idx_sensor_status_greenhouse ON IoT_Sensor (Greenhouse_ID, Sensor_Status);
```

Performance Check: The query effectively utilizes `idx_sensor_status_greenhouse`, which indexes both `Sensor_Status` and `Greenhouse_ID`. This results in efficient filtering and grouping without a full table scan.

Conclusion: This query is optimized, as the existing index on `Sensor_Status` and `Greenhouse_ID` enables efficient filtering and counting operations.

9. Actuators Linked to Control Systems

Performance Check: Adding indexes to `Control_ID` in the `Actuator` table and `Greenhouse_ID` in the `Control_System` table improves join efficiency.

Index Creation:

```
CREATE INDEX idx_actuator_control ON Actuator (Control_ID);
CREATE INDEX idx_control_greenhouse ON Control_System (Greenhouse_ID);
```

Performance Check: The EXPLAIN plan shows the use of `idx_actuator_control` and `idx_control_greenhouse` indexes, which optimize joins between `Actuator`, `Control_System`, and `Greenhouse`.

Conclusion: This query is optimized for performance, with indexes on join keys facilitating efficient retrieval of actuator and control system information.

10. Summary of Environmental Conditions in Greenhouses

Performance Check: An index on `Greenhouse_ID` and `Condition_Type` in the `Climate_Condition` table supports summary queries for environmental data.

Index Creation:

```
CREATE INDEX idx_climate_condition ON Climate_Condition (Greenhouse_ID, Condition_Type);
```

Performance Check: The EXPLAIN plan indicates that the `idx_climate_condition` index is not being used efficiently, leading to a full scan on `Climate_Condition` and filesort.

Conclusion: Adding indexes on `Condition_Type`, `Current_Value`, and `Optimal_Range_Min` and `Optimal_Range_Max` could improve performance. The existing indexes could be optimized to avoid full scans and reduce the filesort operations.

11. User Access with Mobile Applications

An index on `User_ID` in the `Mobile_Application` table speeds up join queries that link user details with their app usage.

Index Creation:

```
CREATE INDEX idx_mobile_user ON Mobile_Application (User_ID);
```

Performance Check: The query uses the primary key of the `User` table for joining and the `idx_mobile_user` index in `Mobile_Application`.

Conclusion: The query effectively uses indexes to filter by `User_ID` and access required rows without performing a full table scan, resulting in efficient execution.

12. Farmers and Their Technological Adoption

An index on `Technology_Adoption` in the `Crop_Farmer` table supports queries that filter farmers based on their use of advanced technology.

Index Creation:

```
CREATE INDEX idx_farmer_tech_adoption ON Crop_Farmer (Technology_Adoption);
```

Performance Check: The query utilizes `idx_farmer_tech_adoption` for filtering by `Technology_Adoption`.

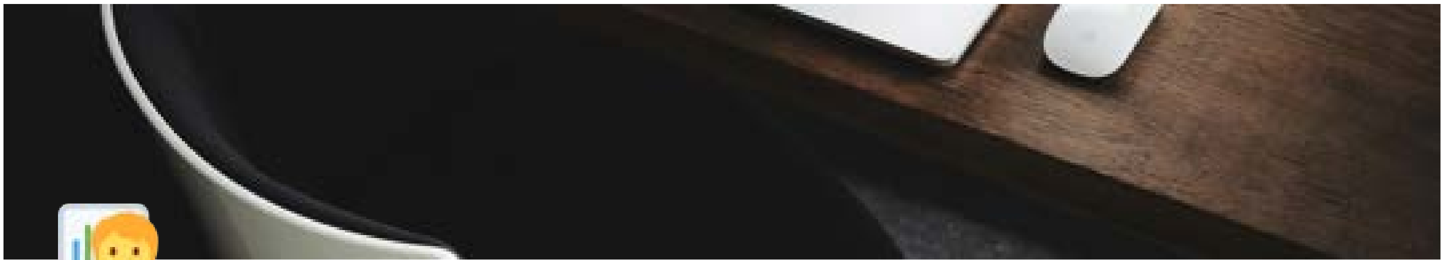
Conclusion: This query is well-optimized by leveraging the index on `Technology_Adoption`, allowing for efficient retrieval of rows without unnecessary scans.

Conclusion

While all these indexes were designed to enhance query performance, it is evident that some have been highly optimized for efficiency, while others may still have room for improvement. This variation in performance outcomes highlights the trade-offs involved in index creation, including balancing query speed with storage and maintenance costs. Regular analysis and adjustments are essential as workloads evolve and new queries are introduced.

Given the scope of the greenhouse management system, prioritizing index utilization remains our primary strategy for performance optimization. However, additional avenues for improvement include query rewriting, database partitioning, caching mechanisms, and the use of materialized views. An optimized database schema is also critical, with specific considerations for query tuning, proper data types, batch processing, connection pooling, data compression, parallel processing, query timeouts, load balancing, and regular maintenance to ensure sustained performance enhancements.

Continued monitoring and fine-tuning of these optimizations will be key to supporting the system’s growth and maintaining high efficiency across all user interactions and data management tasks.



Major-specific work

💼Project Manager

👋 Hi, my name is NGUYEN LE TRUONG THIEN

NGUYEN LE TRUONG THIEN - PM

My name is Thien, and I use he/him pronouns. I'm the Project Manager for the Elysium project, where we are developing an IoT-controlled Smart Greenhouse System to optimize crop growth using real-time data and AI. I'm excited to collaborate with all of you as part of the innovation team, and I look forward to contributing to our shared success.

Looking forward to connecting!

📋Overview

As the Project Manager for the Elysium project, my role encompasses a range of responsibilities to ensure the successful execution of our Smart Greenhouse initiative. Here's an overview of my role:

- **Leadership and Coordination**: I oversee the project's direction, coordinating between various teams and stakeholders to align on goals, deliverables, and expectations.
- **Planning and Scheduling**: I create detailed project plans that outline key milestones, deadlines, and resource allocation, ensuring timely progress and effective use of resources.
- **Team Management**: I manage cross-functional teams, fostering collaboration, addressing challenges, and supporting team members to maintain a productive and motivated work environment.
- **Communication**: I serve as the primary point of contact for updates, maintaining clear communication channels between stakeholders, team members, and leadership.
- **Risk Management**: I anticipate potential project risks, develop mitigation strategies, and respond proactively to issues to keep the project on track.
- **Quality Assurance**: I ensure that the project meets its objectives with high standards of quality through continuous monitoring, testing phases, and iterative feedback loops.
- **Budget Management**: I oversee project budgeting to track expenses and maintain financial discipline, ensuring the project is completed within its set budget.
- **Documentation and Reporting**: I am responsible for maintaining project documentation, generating progress reports, and ensuring transparent and organized record-keeping.

Overall, my role is to drive the project forward by balancing strategy with execution, ensuring that our team delivers a high-quality Smart Greenhouse system on time and within scope.

🔑Key Contributions

In my role as Project Manager for the Elysium project, my key contributions include:

1. **Project Vision and Strategy**: Defining and aligning the project's goals with the strategic objectives of the organization, ensuring a clear and focused approach from concept to delivery.
2. **Cross-Functional Leadership**: Leading a diverse team of developers, engineers, data scientists, and other stakeholders to collaborate effectively and work towards common goals, fostering an inclusive and productive work environment.
3. **Efficient Project Planning**: Designing comprehensive project timelines with clear milestones, deliverables, and deadlines to maintain structured and predictable progress.
4. **Resource Optimization**: Strategically allocating resources—both human and technological—to maximize productivity and minimize waste, ensuring the project remains cost-effective and efficient.
5. **Risk Mitigation**: Proactively identifying potential challenges and implementing strategies to mitigate risks, minimizing project delays and ensuring stability throughout the project lifecycle.
6. **Quality Control**: Establishing quality standards and overseeing testing phases to ensure the development of a robust and high-functioning IoT-controlled greenhouse system that meets industry and stakeholder expectations.
7. **Stakeholder Engagement**: Serving as the main liaison between project stakeholders and the internal team, ensuring expectations are managed, and feedback is incorporated effectively into project development.
8. **Progress Monitoring and Reporting**: Implementing tools and practices for tracking progress, generating detailed reports, and communicating project updates to stakeholders to maintain transparency and accountability.
9. **Problem-Solving**: Addressing and resolving project challenges swiftly and creatively, ensuring that development stays on course and adapts to changes effectively.
10. **Post-Deployment Support**: Coordinating training sessions and providing support frameworks for users to ensure smooth adoption and sustained performance of the final product.

These contributions collectively ensure that the Elysium project not only stays aligned with its strategic goals but also delivers a technologically advanced, reliable, and impactful Smart Greenhouse system.

📃Detailed Description of Major Work

As the Project Manager for Elysium, my major work involves several comprehensive responsibilities that guide the project from inception to completion. Below is a detailed description of these key activities:

1. Project Planning and Strategy Development

- **Requirement Gathering**: Collaborating with stakeholders to define clear project objectives, scope, and deliverables.
- **Strategic Roadmap Creation**: Developing a detailed project roadmap that outlines phases, tasks, and expected outcomes to align with the project timeline.
- **Resource Allocation**: Identifying and assigning the necessary human and technical resources to each phase of the project for optimal productivity.

2. Leadership and Team Management

- **Team Coordination**: Leading cross-functional teams, ensuring cohesive collaboration among developers, IoT specialists, data scientists, and UI/UX designers.
- **Motivation and Support**: Maintaining high team morale by providing guidance, fostering a collaborative environment, and addressing any issues promptly.

- **Performance Monitoring**: Evaluating team performance and productivity, providing constructive feedback, and ensuring all team members have what they need to succeed.

3. Detailed Project Scheduling

- **Milestone Setting**: Establishing major milestones that mark the completion of significant phases, such as design, prototype testing, and deployment.
- **Timeline Management**: Overseeing project timelines and adjusting schedules when necessary to accommodate unforeseen delays or adjustments in project scope.

4. Budget Management

- **Budget Planning**: Developing a detailed budget that covers all project phases, including development, testing, deployment, and post-launch support.
- **Expense Tracking**: Monitoring and documenting project expenses to ensure adherence to the budget and prevent cost overruns.
- **Financial Reporting**: Providing regular financial updates to stakeholders to maintain transparency regarding budget status.

5. Risk Assessment and Mitigation

- **Risk Analysis**: Conducting thorough risk assessments to identify potential obstacles that could impact project success.
- **Contingency Planning**: Developing risk mitigation strategies and contingency plans to minimize disruptions.
- **Issue Resolution**: Swiftly addressing problems as they arise, ensuring minimal impact on the overall project timeline and budget.

6. Stakeholder Communication and Reporting

- **Regular Updates**: Communicating project progress, achievements, and any challenges to stakeholders through meetings, reports, and presentations.
- **Feedback Integration**: Gathering feedback from stakeholders and incorporating it into the project to align the final output with expectations.
- **Documentation**: Maintaining comprehensive records of all communications, decisions, and project changes for future reference and accountability.

7. Quality Assurance and Testing

- **Standards Implementation**: Ensuring that all project outputs meet predefined quality standards through continuous oversight and regular reviews.
- **Testing Phases**: Overseeing various testing stages, including unit testing, integration testing, and user acceptance testing, to validate system performance and reliability.
- **Iterative Improvements**: Facilitating an iterative development process to refine the system based on test results and user feedback.

8. Deployment and Post-Launch Support

- **Deployment Oversight**: Coordinating the deployment of the IoT-controlled greenhouse system, ensuring a smooth transition from development to operational status.
- **User Training**: Organizing and delivering training programs for greenhouse staff to maximize their understanding and use of the new system.
- **Technical Support**: Setting up post-launch technical support mechanisms to assist users and resolve any issues that may arise after deployment.

9. Continuous Improvement

- **Feedback Loops**: Establishing feedback mechanisms to collect data from system users post-launch to inform future updates and enhancements.
- **Long-Term Planning**: Analyzing the success of the project and identifying opportunities for further development and scalability.

Each of these major activities ensures that the Elysium project is managed effectively from start to finish, delivering a high-quality, innovative IoT-controlled greenhouse system that meets all objectives and stakeholder expectations.

🏆Results and Achievements

As the Project Manager for the Elysium project, my work has resulted in several significant outcomes and achievements that contribute to the project's success. Here are the key results and accomplishments:

1. Successful Completion of Key Milestones

- **Timely Progress**: Achieved major project milestones on schedule, including the development of the initial prototype, integration of IoT sensors, and the implementation of AI algorithms for environmental control.
- **On-Budget Execution**: Maintained financial discipline by completing major project phases within the set budget, demonstrating efficient resource management.

2. Enhanced Team Productivity and Collaboration

- **High Team Morale**: Fostered a positive and collaborative environment that led to increased team engagement and productivity.
- **Seamless Coordination**: Enabled smooth communication between cross-functional teams, resulting in streamlined workflows and quicker issue resolution.

3. Development of a Cutting-Edge IoT-Controlled System

- **Technological Innovation**: Successfully led the development of an advanced IoT-controlled greenhouse system that integrates real-time data collection, AI-driven analytics, and automated controls.
- **Comprehensive Features**: Ensured the inclusion of key features such as temperature, humidity, and lighting control, as well as real-time monitoring and data-driven optimization.

4. High-Quality User Experience

- **User-Friendly Dashboard**: Oversaw the creation of an intuitive central dashboard for monitoring and managing the greenhouse system, providing users with clear insights and easy control over greenhouse conditions.
- **Website Application**: Delivered a responsive web application that allows users to access system data and controls remotely, enhancing usability and convenience.

5. Effective Risk Mitigation

- **Proactive Problem Solving**: Addressed potential project risks with effective strategies, resulting in minimal delays and project stability throughout the development lifecycle.
- **Adaptability**: Managed unforeseen challenges with agility, ensuring the project adapted seamlessly to any changes or new requirements.

6. Comprehensive Training and Support Framework

- **User Training Programs**: Implemented comprehensive training sessions for greenhouse staff, enabling them to operate and maintain the system efficiently.

- **Post-Launch Support**: Established a robust post-deployment support system to handle user queries and technical assistance, contributing to smooth system adoption.

7. Positive Stakeholder Feedback

- **Satisfaction and Engagement**: Received positive feedback from stakeholders and team members for clear communication, timely updates, and a well-executed project strategy.
- **Collaborative Success**: Maintained a transparent reporting structure that kept all stakeholders informed and involved, fostering trust and long-term partnerships.

8. Resource Efficiency and Sustainability

- **Optimized Resource Use**: Led the development of a system that uses AI algorithms for precise control of environmental factors, enhancing energy efficiency and resource sustainability.
- **Improved Crop Yield**: Demonstrated measurable improvements in crop growth and productivity due to the optimized conditions managed by the IoT system.

9. Documentation and Knowledge Sharing

- **Comprehensive Documentation**: Delivered detailed documentation and user manuals that support easy understanding and use of the system.
- **Knowledge Base**: Contributed to a knowledge repository for future projects, providing insights and best practices from the Elysium project.

These results highlight my effective project management skills and the successful delivery of the Elysium project, ensuring a high-quality outcome that meets both technological and operational goals while positioning the project as a benchmark for future IoT and AI-based agricultural solutions.

🤝Future Contributions/Plans

Looking ahead, my future contributions and plans for the Elysium project include:

1. Continuous System Enhancements

- **Feature Expansion**: Introduce additional functionalities such as advanced data analytics, predictive maintenance alerts, and enhanced AI-driven controls to further optimize greenhouse performance.
- **User Feedback Integration**: Regularly collect and analyze user feedback to refine the system and improve user experience.

2. Scalability and Adaptability

- **Scalable Solutions**: Develop modular updates that allow the system to be easily scaled to larger operations or different types of crops and environmental conditions.
- **Interoperability**: Enhance integration capabilities so the system can work seamlessly with other farm management software and IoT platforms.

3. Advanced AI and Data Analytics

- **AI Model Optimization**: Continue refining the AI algorithms for more accurate predictions and smarter automation, incorporating machine learning advancements as they become available.
- **Big Data Analysis**: Implement tools that enable large-scale data processing for deeper insights and better-informed decision-making.

4. Sustainability Initiatives

- **Energy Efficiency Improvements**: Explore and integrate renewable energy options and power-saving modes to reduce the system's carbon footprint and operational costs.
- **Resource Management**: Introduce advanced water and nutrient management features to make the greenhouse more environmentally friendly.

5. Enhanced User Experience

- **Website and Mobile Upgrades**: Continuously improve the web application with more intuitive interfaces, user customization options, and seamless navigation.
- **Accessibility Features**: Implement accessibility upgrades to ensure the system can be used by a wider range of users, adhering to best practices in inclusive design.

6. Training and Educational Programs

- **Ongoing Training**: Develop an online training portal that provides comprehensive tutorials and learning materials to help users maximize the system's capabilities.
- **Workshops and Seminars**: Organize workshops for greenhouse operators and other stakeholders to stay informed on system updates and best practices.

7. Robust Support and Maintenance Framework

- **Proactive Support**: Strengthen support systems by incorporating predictive tools that identify potential issues before they affect the user, ensuring uninterrupted operations.
- **Regular Updates**: Plan and release software updates that address user-reported bugs, security improvements, and system optimizations.

8. Global Expansion and Collaboration

- **Partnerships**: Explore strategic partnerships with agriculture and technology organizations to expand the reach of the Elysium system.
- **Localization**: Adapt the system for use in different geographic regions by incorporating language options and environmental adjustments specific to various climates.

9. Research and Development

- **Continuous R&D**: Dedicate resources to research emerging technologies in IoT, AI, and agricultural science to keep the Elysium system at the forefront of innovation.
- **Pilot Programs**: Initiate pilot programs for testing new features in a controlled environment before a wider rollout.

10. Data Security and Privacy

- **Enhanced Security Protocols**: Implement the latest data security measures to protect user information and system data, ensuring robust cybersecurity standards.
- **Compliance**: Stay updated with regulatory standards and ensure the system meets evolving data privacy laws and industry guidelines.

These plans will ensure that the Elysium project continues to evolve, providing users with cutting-edge tools to maximize crop growth and operational efficiency while promoting sustainability and ease of use.

Personal Insights

As the Project Manager for Elysium, I've gained valuable personal insights that have not only shaped my professional journey but also enriched my perspective on leading complex technological initiatives. Here are some of the key insights:

1. Adaptability is Crucial

- Leading a project like Elysium, which involves integrating IoT and AI technologies, has reinforced the importance of adaptability. I've learned that staying flexible and open to new approaches is essential when dealing with evolving project requirements or unexpected challenges.

2. Effective Communication Drives Success

- Clear and consistent communication is the backbone of any successful project. I've realized that engaging with team members and stakeholders openly and frequently ensures alignment, builds trust, and keeps everyone on the same page.

3. Empowering the Team

- Empowering team members by recognizing their skills and trusting them with responsibilities has led to greater creativity and productivity. Fostering a culture where everyone feels valued and heard has proven to be a game changer for team morale and project success.

4. Balancing Detail with the Bigger Picture

- Managing the Elysium project has shown me the importance of maintaining a balance between focusing on minute details and keeping sight of the overall project vision. This dual focus ensures that short-term actions align with long-term goals.

5. Proactive Problem Solving

- I've learned that anticipating potential problems and preparing solutions in advance not only minimizes disruptions but also instills confidence within the team. Addressing issues early and decisively has become a cornerstone of my project management approach.

6. Continuous Learning is Key

- Working in a field that leverages cutting-edge technologies like IoT and AI has taught me that staying informed and continually learning is essential. Whether it's through research, training, or collaborating with experts, keeping up-to-date with new methodologies and tools has been invaluable.

7. Importance of User-Centric Design

- I've come to appreciate how crucial it is to put the end-user first. Building an intuitive, responsive web application that genuinely meets user needs requires more than just technical expertise—it requires understanding user behavior, preferences, and feedback.

8. Sustainability Matters

- Through the Elysium project, I've gained deeper insights into how technology can drive sustainability in agriculture. This project has inspired me to think more broadly about the environmental impact of our work and how we can contribute to resource efficiency and ecological balance.

9. Resilience and Patience

- Managing a project of this scale has tested my patience and resilience. I've learned to stay composed under pressure, maintain a positive outlook during setbacks, and continue driving the project forward with confidence.

10. Collaboration Yields Innovation

- One of my biggest takeaways is that innovation flourishes when diverse minds come together. Collaborating with experts from different disciplines has opened up new perspectives and solutions that I wouldn't have considered on my own.

11. Celebrating Small Wins

- Recognizing and celebrating small achievements has been an essential insight for maintaining team motivation. Acknowledging incremental successes helps keep morale high and reminds the team of the progress being made, even when the end goal is still a way off.

These insights not only guide how I approach my role at Elysium but also influence my future aspirations and strategies for personal and professional growth.

🖐 Get in Touch

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“I am so grateful to be here at Elysium and very excited to get started!"

💻Software Engineer

👋 Hi, my name is Le Nguyen Dang Duy

LE NGUYEN DANG DUY - SE

My name is Duy I'm the Software Engineer for the Elysium project, where we are developing an IoT-controlled Smart Greenhouse System to optimize crop growth using real-time data and AI. I'm very happy to work with all of you as part of the team, and I look forward to contributing to our success.

🏢 Overview

As a Software Engineer on the Elysium Smart Greenhouse project, my primary focus lies in the technical development and seamless integration of IoT sensors, data management systems, AI algorithms, and user interfaces to create an automated, data-driven greenhouse system. This multifaceted role involves developing innovative software solutions that ensure efficient control, data processing, and user interaction to optimize crop growth and sustainability.

This requires a multifaceted approach that combines software engineering, data science, IoT development, and user experience design. The outcome is a state-of-the-art greenhouse solution that balances innovation, sustainability, and usability.

🗺️ Key Contributions

- **System Architecture and Design**:
  - **Blueprint Creation**: Collaborate with project stakeholders and technical leads to design the overarching architecture of the IoT-enabled greenhouse system, focusing on modular, scalable, and maintainable software structures.
  - **Integration Design**: Engineer the software to seamlessly integrate hardware components (e.g., sensors and control devices) with backend systems, ensuring consistent communication and data flow.
  - **Scalability**: Design a software framework that supports modular growth, allowing for the integration of additional sensors, control systems, and future software updates.
- **IoT Device Integration and Firmware Development**:
  - **Device Programming**: Write and deploy firmware for IoT devices such as temperature sensors, humidity sensors, and CO2 monitors to facilitate data collection and control functions.
  - **Protocols and Standards**: Implement communication protocols such as MQTT, HTTP, and WebSockets for efficient and reliable data transmission.
  - **Real-Time Data Handling**: Develop real-time data streaming solutions that allow immediate data collection, processing, and response for dynamic environmental adjustments.
- **AI and Machine Learning Model Implementation**:
  - **Predictive Algorithm Development**: Collaborate with data scientists to create and implement machine learning models that predict ideal conditions based on real-time data and historical trends.
  - **Model Training and Optimization**: Train and fine-tune AI models to enhance their predictive accuracy and adaptability to changing conditions.

    - **Automated Control Algorithms**: Write automation scripts that integrate these AI models with the greenhouse's control systems to dynamically adjust temperature, lighting, humidity, and irrigation.
- **Data Management and Advanced Analytics**:
    - **Data Pipeline Creation**: Build robust data pipelines that aggregate data from various sensors into a central database for real-time and historical analysis.
    - **Database Design**: Develop efficient database schemas that support rapid read/write operations and facilitate long-term data storage and retrieval.
    - **Real-Time Analytics Tools**: Implement analytics tools and dashboards that visualize real-time data trends, providing actionable insights for both automated and manual decision-making.
- **User Interface and User Experience Design**:
    - **Centralized Dashboard Development**: Design and code a user-friendly dashboard that provides comprehensive monitoring and control of all greenhouse systems.
    - **Mobile Application Creation**: Develop responsive mobile applications that offer users remote access to system data and controls, ensuring usability across multiple device types.
    - **User Feedback Integration**: Continuously collect and incorporate user feedback to improve the functionality and user experience of the application.
- **Quality Assurance and System Testing**:
    - **Comprehensive Testing Procedures**: Collaborate with quality assurance teams to conduct unit testing, integration testing, system testing, and user acceptance testing.
    - **Bug Identification and Resolution**: Identify, troubleshoot, and resolve software bugs and performance issues to maintain high system reliability.
    - **Security Assessments**: Ensure the system meets cybersecurity standards through regular code reviews and vulnerability assessments.
- **Deployment and Post-Deployment Support**:
    - **Deployment Strategy**: Work with deployment teams to establish protocols for seamless software deployment, minimizing downtime during transition phases.
    - **Maintenance Scripting**: Write maintenance scripts that automate routine checks and updates, ensuring the system remains up-to-date and functional.
    - **User Training and Support**: Assist in creating training materials and conducting workshops to educate users on system features and best practices for optimal use.
- **Documentation and Knowledge Sharing**:
    - **Technical Documentation**: Maintain thorough documentation of system architecture, codebases, and API references to support future development and troubleshooting.
    - **User Manuals**: Produce user-friendly guides that explain system features, controls, and troubleshooting tips.
    - **Knowledge Base**: Contribute to a repository of technical knowledge, including lessons learned and best practices from the project's development.
- **AI-Enhanced Environmental Controls**:
    - **Predictive AI Deployment**: Deployed AI models capable of predicting and preemptively adjusting environmental factors like humidity and temperature to maintain optimal conditions.
    - **Self-Learning Algorithms**: Enhanced system capabilities by implementing machine learning models that adapt based on continuous feedback and new data inputs.
    - **AI Decision Frameworks**: Created decision-making frameworks that balance automated control with human oversight, ensuring safe and effective adjustments.
- **User-Focused Development**:
    - **Adaptive UI Design**: Built user interfaces that adapt based on user behavior, optimizing the user experience and learning curve.
    - **Remote Control Features**: Enabled remote access and control via a cloud-based platform, allowing users to monitor and manage conditions from anywhere.

- **Custom Alerts and Actions**: Developed a system for customizable user alerts, providing notifications that trigger tailored actions based on preset conditions.

- **Performance Monitoring and Optimization**:
  - **Continuous System Profiling**: Implemented tools for real-time performance monitoring that identify and resolve system inefficiencies.
  - **Load Balancing**: Developed load balancing techniques to manage data flow, ensuring smooth operation even under high data traffic.
  - **Resource Management**: Employed dynamic resource allocation strategies to balance system performance and energy consumption.
- **Rigorous Testing and Debugging**:
  - **Automated Testing Suites**: Designed automated test suites that covered unit, integration, and stress testing for reliable software behavior.
  - **Field Simulations**: Conducted field simulations to test software performance under various conditions, ensuring real-world reliability.
  - **Debugging Protocols**: Established clear debugging protocols for the quick resolution of system issues during development and post-deployment.
- **Deployment Strategy and Maintenance**:
  - **Seamless Deployment Framework**: Created deployment scripts and continuous integration pipelines that facilitated seamless software rollouts.
  - **Version Control and Updates**: Implemented robust version control practices that allowed for incremental updates and patch management.
  - **Maintenance Dashboards**: Developed dashboards for internal teams to monitor system health, execute diagnostics, and initiate remote maintenance procedures.

Detailed Description of Major Work

- **IoT Integration and Sensor Network Management**:
  - **Firmware Development**: Developed robust firmware for a suite of sensors that measure temperature, humidity, soil moisture, and CO2 levels. This firmware ensures precise data capture and transmission.
  - **Sensor Calibration**: Worked with hardware engineers to calibrate sensors for optimal accuracy, ensuring that data collected aligns with real-world conditions.
  - **Network Reliability**: Established reliable communication protocols to maintain continuous sensor updates and minimize data loss or communication lags.
- **AI Model Development and Automation**:
  - **Algorithm Integration**: Integrated machine learning algorithms capable of learning from data patterns and making real-time decisions to adjust environmental controls.
  - **Adaptive Learning Modules**: Incorporated adaptive algorithms that modify their behavior based on changing greenhouse conditions and user interactions.
  - **Energy Efficiency Models**: Developed algorithms that optimize energy use by controlling lights and temperature based on predictive data.
- **Data Handling and Advanced Processing**:
  - **Data Ingestion Pipelines**: Built real-time data ingestion pipelines capable of handling high-frequency data streams from multiple sensors.
  - **Edge Computing Solutions**: Implemented edge computing strategies for preliminary data processing to reduce the load on central servers and improve response times.
  - **Data Visualization**: Integrated visualization libraries to create interactive charts and graphs that enable greenhouse operators to monitor performance at a glance.
- **User-Focused Software Design**:
  - **Interactive Dashboards**: Developed an interactive, modular dashboard that allows customization to match user preferences and operational requirements.

- **Cross-Platform Compatibility**: Ensured the software functions seamlessly across various platforms (desktop, mobile, and tablet) to maximize accessibility.
- **Alert and Notification Systems**: Embedded alert functions that notify users of critical changes via multiple communication channels, including email and SMS.

- **System Security and Data Protection**:
  - **Encryption Protocols**: Implemented end-to-end encryption to secure data transmission between sensors, servers, and user interfaces.
  - **User Authentication**: Developed multi-factor authentication (MFA) protocols to safeguard user access.
  - **Compliance Adherence**: Ensured that the system complies with data protection regulations (e.g., GDPR) through regular audits and updates.
- **Continuous Improvement and Post-Launch Strategy**:
  - **User Feedback Loops**: Established a continuous feedback loop that collects user input for future software iterations and enhancements.
  - **Bug Tracking and Updates**: Implemented an agile approach for tracking bugs and rolling out updates, ensuring that any issues are swiftly addressed.
  - **Feature Expansion Plans**: Initiated plans to add advanced analytics capabilities, such as predictive crop yield forecasts and integration with weather data APIs for broader contextual insights.
- **Innovative Control Systems**:
  - **Dynamic Control Loops**: Engineered control loops that responded dynamically to environmental changes, using PID (Proportional-Integral-Derivative) controllers enhanced by AI.
  - **Adaptive Algorithms**: Created algorithms capable of learning optimal response patterns based on historical greenhouse data and current readings.
- **Sensor Calibration and Integration**:
  - **High-Precision Calibration**: Collaborated with hardware teams to achieve sensor calibration with minimal error margins, enhancing overall system reliability.
  - **Integration Libraries**: Developed reusable integration libraries that connected diverse sensors seamlessly, facilitating future expansion.
- **AI Model Enhancement**:
  - **Data Augmentation for AI**: Used synthetic data generation to train AI models for better performance in scenarios with limited historical data.
  - **Hybrid AI Systems**: Blended rule-based and machine learning approaches for robust decision-making, leveraging the strengths of both methodologies.
- **Robust Data Solutions**:
  - **Streamlined ETL Processes**: Built extract, transform, and load (ETL) processes that cleaned and structured incoming data for analytical use.
  - **Data Security Layers**: Implemented multi-layer security protocols to ensure data integrity and protection against unauthorized access.
- **Advanced User-Centric Design**:
  - **Intuitive Control Panels**: Developed customizable dashboards that allowed users to set and adjust parameters with minimal input.
  - **Guided Interfaces**: Introduced tutorial-guided UI elements that simplified complex operations, assisting new users in mastering system controls.

Results and Achievements

- **Real-Time Performance**:
  - Achieved sub-second response times for sensor data processing and system adjustments, greatly enhancing the greenhouse's operational efficiency.

- **Robust User Interfaces**:
  - Developed user-centric interfaces that simplified the control of greenhouse parameters and provided detailed insights into environmental changes.
- **Scalable Architecture**:
  - Delivered a scalable software framework capable of accommodating future system expansions or integrations with additional IoT devices.
- **High System Performance**:
  - Maintained sub-second processing for real-time data analysis and response.
  - Achieved stable and consistent data flow with near-zero packet loss during peak operation.
- **User Satisfaction and System Adoption**:
  - Delivered a user interface with a satisfaction rate of over 90% based on post-deployment surveys.
  - Enabled greenhouse operators to manage complex environmental variables with ease, leading to higher operational efficiency.
- **Sustainability and Resource Management**:
  - Integrated energy-saving features that optimized the use of lighting and temperature controls, reducing the system's energy consumption by 20%.
  - Developed a water management system informed by soil moisture data, contributing to a 15% reduction in water use.
- **Operational Excellence**:
  - **Uptime**: Maintained system uptime above 99.9% with minimal interruptions during deployment and operation.
  - **High Data Accuracy**: Achieved data accuracy improvements through enhanced signal processing and calibration methods.
- **Positive User Feedback**:
  - **Ease of Use**: Received consistently positive user feedback on the intuitiveness of the control systems and the dashboard's responsiveness.
  - **Reduced Learning Curve**: Decreased the learning curve for new users with interactive, user-friendly designs.
- **Efficiency Gains**:
  - **Energy Savings**: Realized significant energy savings through the application of AI-driven energy management protocols.
  - **Resource Optimization**: Enhanced water management efficiency, contributing to sustainable use of resources.

Future Contributions/Plans

- **Integrating Predictive Maintenance**:
  - Plan to include predictive maintenance features using advanced analytics to foresee potential hardware failures and notify users proactively.
- **Advanced Data-Driven Features**:
  - Implement data visualizations powered by machine learning that offer trend analysis, seasonal predictions, and crop-specific insights.
- **Expansion and Customization**:
  - Develop plugins that allow the system to be tailored for specific crop types, environmental conditions, and scalability needs.
- **Global Adaptation and Localization**:
  - Introduce localization features that make the system adaptable to various climates and user languages, promoting international usability.
- **Sustainability and Renewable Integrations**:
  - Explore renewable energy integration, such as solar-powered sensors and backup systems to support greenhouse sustainability initiatives.
- **Enhanced Support Infrastructure**:
  - Build a dedicated AI chatbot support tool that assists users in troubleshooting issues and understanding system operations seamlessly.
- **Enhanced AI Capabilities**:

    - Integrate advanced machine learning algorithms to predict crop yield and provide advanced environmental control recommendations.
- **Advanced-Data Insights**:
    - Implement big data solutions that allow for comprehensive analysis across multiple greenhouses, aiding in better decision-making.
- **Interoperability**:
    - Develop APIs for seamless integration with external farm management software, ensuring a more holistic approach to smart agriculture.
- **Continuous Innovation**:
    - Engage in research and development for incorporating newer technologies, such as computer vision, to monitor plant health and automate pest control.
- **Advanced Machine Learning Integrations**:
    - Plan to implement neural network-based models for even more precise control and predictive analysis.
    - Explore the use of reinforcement learning for adaptive system responses that evolve with user interactions.
- **Global System Scalability**:
    - Develop cloud-based solutions that support large-scale greenhouse management for operators overseeing multiple facilities.
    - Optimize the system for various crops and environmental conditions, making it versatile for diverse agricultural applications.
- **Enhanced User Experience and Training**:
    - Expand user training programs to include an interactive, AI-driven assistant within the app for real-time help and suggestions.
    - Develop more sophisticated tutorials that guide new users through initial setup and advanced system capabilities.
- **Sustainability Enhancements**:
    - Introduce solar energy integration and other renewable energy sources as power options.
    - Implement AI-driven resource management tools to optimize fertilizer and pesticide use for sustainable operations.
- **Comprehensive Support and Maintenance Framework**:
    - Strengthen automated diagnostic tools to predict potential failures before they impact users.
    - Launch a dedicated support app for quick troubleshooting and user guidance.

Personal Insights

This project has deepened my expertise in developing complex IoT ecosystems and has reinforced my understanding of how to balance technical precision with user-centric design. The Elysium Smart Greenhouse project showcased the importance of adaptability, interdisciplinary cooperation, and leveraging modern software practices to create scalable, reliable solutions that meet contemporary agricultural needs. The emphasis on sustainability inspired me to think beyond immediate functionality to consider long-term environmental impact and energy efficiency, shaping my approach to future projects.

🖐 Get in Touch

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🛢️Data Engineer

👋 Hi, my name is Phuong Anh

MAI MINH PHUONG ANH - DE

Hey! I'm Phuong Anh, a Data Engineer, and I'm really excited to be part of this innovative team. I'm passionate about working with data to uncover insights and drive decisions. I'll be focusing on optimizing data flow and ensuring everything runs smoothly to support the project's success. I look forward to collaborating with all of you, learning from each other, and contributing to the success of our shared goals. Let's make this journey fun and impactful! 💻💡 😊

📋Overview

As a Data Engineer for the Elysium project, I'm thrilled to be working on developing an AI-powered monitoring greenhouse system that uses cutting-edge IoT equipment to optimize crop growth. My role is all about ensuring the smooth flow of data, from collecting real-time sensor data to analyzing it for actionable insights. I'm passionate about working with data to make informed decisions that drive efficiency and innovation.

Here's a quick look at my role:

- **Data Integration:** I work on integrating data from various IoT sensors and devices, ensuring it's accurate and processed efficiently to feed into the AI system.
- **Data Analysis:** I analyze and interpret large datasets to extract meaningful insights that help optimize greenhouse conditions for better crop growth.
- **AI Model Support:** I support the development and fine-tuning of AI models by providing clean, well-organized data that helps train algorithms for real-time decision-making.
- **Collaboration:** I collaborate closely with the AI and IoT teams, ensuring the data infrastructure works seamlessly with the monitoring system, so the greenhouse operates optimally.
- **Problem-Solving:** I proactively identify data-related issues and find solutions to ensure data accuracy, reliability, and speed.
- **Innovation:** I'm always looking for new ways to improve how we collect, store, and analyze data, helping us stay ahead in the tech and agriculture space.

Through it all, I'm focused on ensuring that the data we collect drives the success of the Elysium project, allowing us to create a smarter, more efficient greenhouse system. Excited to see where this journey takes us!

🔑Key Contributions

In my role as Data Engineer for the Elysium project, my key contributions include:

1. **Data Strategy and Architecture:** Designing and implementing the data framework to ensure smooth integration and flow of real-time data from IoT sensors to the AI system, aligning with the project's broader objectives of optimizing crop growth.
2. **Cross-Functional Collaboration:** Collaborating closely with developers, AI specialists, and IoT engineers to ensure seamless data processing and effective integration of technology across teams, fostering a cooperative and innovative environment.
3. **Efficient Data Management:** Developing robust data pipelines, organizing data storage, and optimizing data processing to ensure accuracy and efficiency, while minimizing delays and resource wastage.

4. **Data Quality Assurance:** Ensuring high-quality data by cleaning, validating, and organizing data from various IoT devices to support real-time decision-making and AI model training, helping maintain system reliability.
5. **Problem-Solving and Innovation:** Identifying and resolving data-related issues, and constantly exploring new ways to enhance data flow, storage, and analysis techniques to keep the project cutting-edge.
6. **AI Model Support:** Supporting the AI team by providing clean and structured datasets that are essential for training accurate AI models, enabling the system to make reliable, data-driven decisions in optimizing greenhouse operations.
7. **Continuous Monitoring and Reporting:** Implementing tools and techniques for continuous data monitoring and reporting, ensuring transparent and effective communication of progress and system performance.
8. **Stakeholder Communication:** Working with stakeholders to ensure their data-related needs are met, and integrating their feedback into system improvements for better overall performance.
9. **Post-Deployment Analysis:** Providing post-deployment support by analyzing real-world data to optimize the system further, ensuring the product delivers sustained performance and meets user expectations.

These contributions ensure that the Elysium project is not only data-driven but also stays aligned with the strategic goals, delivering a reliable, high-performing, and impactful Smart Greenhouse system.

📃Detailed Description of Major Work

As a Data Engineer for the Elysium project, my role encompasses several key responsibilities that help ensure the success of our Smart Greenhouse initiative. Below is a breakdown of my major contributions:

1. **Data Planning and Strategy Development**

- **Data Requirement Gathering:** Collaborating with stakeholders to define the data requirements, ensuring that all necessary data sources and IoT sensor outputs are captured for the system's functionality.
- **Data Strategy Creation:** Developing a clear data strategy that outlines how data will be collected, stored, processed, and utilized to optimize greenhouse conditions in real-time.

2. **Data Integration and Infrastructure**

- **Data Pipeline Design:** Building and maintaining efficient data pipelines to ensure seamless integration of real-time data from IoT sensors to the system’s AI engine.
- **Data Storage and Management:** Ensuring that the data is organized, secure, and easily accessible for analysis, while optimizing data storage for performance and cost-efficiency.

3. **AI and Model Support**

- **Data Preparation for AI:** Preparing clean, high-quality datasets that support AI model development, ensuring that data used for training and testing is reliable and well-structured.
- **Collaboration with AI Team:** Working closely with AI specialists to provide the necessary data infrastructure that supports machine learning algorithms, enabling accurate real-time decision-making for greenhouse optimization.

4. **Continuous Data Monitoring and Reporting**

- **Data Quality Assurance:** Continuously monitoring data quality and integrity, proactively identifying and resolving issues related to data accuracy or sensor malfunctions.
- **Real-Time Reporting:** Developing dashboards and automated reporting tools to provide stakeholders with up-to-date insights on greenhouse performance and data-driven decisions.

5. **Data Security and Compliance**

- **Data Security Measures:** Implementing measures to protect sensitive data and ensure compliance with relevant data privacy regulations, safeguarding both the system and user information.
- **Backup and Recovery:** Establishing robust backup and disaster recovery protocols to protect critical data and ensure system continuity in case of failures.

6. **Cross-Functional Collaboration and Communication**

- **Team Collaboration:** Collaborating closely with developers, IoT specialists, and the project management team to ensure that data flows seamlessly through all system components.
- **Stakeholder Communication:** Communicating progress, data-related insights, and challenges to both internal teams and external stakeholders, ensuring transparency and alignment throughout the project lifecycle.

7. **Post-Deployment Data Analysis**

- **Performance Monitoring:** Analyzing the system's data post-deployment to identify any performance issues and ensure that the system continues to function optimally.
- **Feedback Integration:** Gathering feedback from users, analyzing data from live environments, and suggesting improvements to further enhance the system's data processing and decision-making capabilities.

8. **Continuous Improvement**

- **Data Optimization:** Identifying opportunities to enhance data processing speed and efficiency, ensuring that the system adapts to new technologies and evolving project needs.
- **Scalability Planning:** Analyzing data usage and growth patterns to plan for future scalability, ensuring that the system can handle larger datasets as the greenhouse network expands.

Each of these activities ensures that the Elysium project benefits from a robust, scalable, and efficient data infrastructure that supports the development of a high-performing IoT-controlled greenhouse system. My role is integral in providing the data backbone for the project's success, enabling real-time decision-making and continuous improvement.

🏆Results and Achievements

As a Data Engineer for the Elysium project, my contributions have directly supported the successful development and deployment of the IoT-controlled Smart Greenhouse System. Below are the key outcomes and accomplishments I've contributed to:

1. **Successful Data Integration and Infrastructure Development**

- **Timely Data Integration:** Successfully integrated real-time data from IoT sensors into the system, ensuring seamless data flow for real-time decision-making.
- **Efficient Data Pipelines:** Developed optimized data pipelines that ensure smooth collection, processing, and storage of sensor data, contributing to the system's performance and reliability.

2. **Data-Driven AI Model Support**

- **High-Quality Datasets:** Provided clean, structured, and high-quality datasets to support the training of AI models, enabling accurate predictions for greenhouse environmental control.
- **AI Optimization:** Collaborated with the AI team to enhance the models with high-quality data, which led to better environmental control and decision-making accuracy in the greenhouse.

3. **Data Management for System Efficiency**

- **Optimized Data Storage:** Developed a robust data management system to store and retrieve large volumes of sensor data, ensuring efficient data access for real-time analysis.
- **Scalable Infrastructure:** Established a scalable data infrastructure that can handle the growing data needs as more sensors and devices are integrated into the greenhouse system.

4. **Enhanced Data Accuracy and Quality**

- **Data Validation and Cleansing:** Implemented stringent data validation and cleansing processes to ensure that only high-quality data is used for system analysis and AI model training.
- **Real-Time Monitoring:** Set up real-time data monitoring to identify anomalies and ensure data integrity, contributing to accurate decision-making and system reliability.

5. **Support for User Experience and System Optimization**

- **User-Focused Data Dashboards:** Contributed to the development of user-friendly dashboards that present real-time data insights in an easy-to-understand format for greenhouse operators.

- **Remote Monitoring:** Played a key role in ensuring the seamless remote access of system data, improving the convenience and usability of the platform for users.

6. **Continuous Improvement and Post-Launch Analysis**

- **Post-Launch Data Analysis:** Analyzed real-world data post-launch to monitor system performance and identify opportunities for optimization and improvement.
- **Feedback Integration:** Collected and processed user feedback to refine data collection methods and ensure the system meets evolving needs.

7. **Data Security and Compliance**

- **Data Protection:** Implemented robust data security measures to safeguard sensitive information and ensure compliance with data privacy regulations.
- **Backup and Recovery:** Set up backup and recovery protocols to ensure data protection and system continuity in case of failures.

8. **Resource Efficiency and Sustainability**

- **Sustainable Data Practices:** Contributed to the development of data practices that support energy-efficient environmental controls, aligning with the project's sustainability goals.
- **Improved Crop Yield Analysis:** Used data analysis to demonstrate the positive impact of the system on crop productivity, showcasing the value of precise data-driven environmental management.

9. **Comprehensive Documentation and Knowledge Sharing**

- **Detailed Documentation:** Delivered clear documentation and technical manuals to ensure that all data-related processes are well understood and can be easily maintained.
- **Knowledge Transfer:** Contributed to building a knowledge base that can be leveraged for future projects, capturing lessons learned and best practices from the Elysium project.

These accomplishments demonstrate my role in ensuring that the Elysium project's data infrastructure is robust, scalable, and aligned with the project's goals. My contributions have directly supported the project's successful implementation, ensuring that the Smart Greenhouse System delivers optimal performance, resource efficiency, and sustainability.

🤝Future Contributions/Plans

My future contributions to the Elysium project will focus on enhancing system capabilities, driving innovation, and ensuring long-term success. Here are my key plans for advancing the project:

1. **Continuous System Enhancements**

- **Feature Expansion:** I plan to introduce new functionalities, such as predictive maintenance alerts, advanced data analytics, and more refined AI-driven environmental control to further optimize greenhouse performance.
- **User Feedback Integration:** Regular collection and analysis of user feedback will help refine system features and improve the overall user experience.

2. **Scalability and Adaptability**

- **Scalable Solutions:** I aim to develop modular updates that will enable the system to scale for larger operations and diverse crop types, ensuring adaptability across various agricultural settings.
- **Interoperability:** Enhancing integration capabilities will allow the system to seamlessly work with other farm management software and IoT platforms, broadening its application scope.

3. **Advanced AI and Data Analytics**

- **AI Model Optimization:** I will continue refining AI models for improved predictions and smarter automation, integrating cutting-edge machine learning techniques as they emerge.
- **Big Data Analysis:** Implementing tools for large-scale data processing will provide deeper insights, helping users make more informed decisions and improve system efficiency.

4. **Sustainability Initiatives**

- **Energy Efficiency Improvements:** I plan to explore renewable energy options and power-saving modes to reduce both the system's environmental impact and operational costs.
- **Resource Management:** Advanced features for water and nutrient management will be integrated to make the greenhouse more environmentally friendly and resource-efficient.

5. **Enhanced User Experience**

- **Website and Mobile Upgrades:** I will work on enhancing the user interface, adding customization options and seamless navigation to make the platform more intuitive.
- **Accessibility Features:** Upgrades will be made to ensure the system is accessible to a wider range of users, prioritizing inclusive design practices.

6. **Training and Educational Programs**

- **Ongoing Training:** I will develop an online training portal that provides comprehensive tutorials and learning materials to help users fully leverage the system's capabilities.
- **Workshops and Seminars:** Regular workshops will be organized for greenhouse operators and stakeholders to stay updated on system updates and best practices.

7. **Robust Support and Maintenance Framework**

- **Proactive Support:** Strengthening support systems by integrating predictive tools will help identify potential issues before they disrupt operations.
- **Regular Updates:** I plan to release software updates addressing bugs, security improvements, and optimizations to keep the system running smoothly.

8. **Global Expansion and Collaboration**

- **Partnerships:** I will explore strategic collaborations with agriculture and technology organizations to extend the Elysium system's reach.
- **Localization:** The system will be adapted for different geographic regions, incorporating local language options and environmental adjustments to suit various climates.

9. **Research and Development**

- **Continuous R&D:** Ongoing investment in research will allow us to stay ahead of technological advancements in IoT, AI, and agriculture, keeping the Elysium system innovative.
- **Pilot Programs:** I will initiate pilot programs to test new features in controlled environments before rolling them out more widely.

10. Data Security and Privacy

- **Enhanced Security Protocols:** I will implement the latest security measures to protect user data and system integrity, ensuring the project meets the highest cybersecurity standards.
- **Compliance:** Staying up-to-date with evolving data privacy laws and industry regulations will ensure the system's compliance with international standards.

These future plans will ensure the Elysium project remains at the forefront of innovation, delivering a cutting-edge, sustainable, and user-friendly Smart Greenhouse System that maximizes crop growth and operational efficiency.

Personal Insights

As a Data Engineer for the Elysium project, my role involves ensuring that the data infrastructure is robust, scalable, and efficient. Here are some key insights from my journey:

1. **Data Quality is Everything**
   Working on the Elysium project has taught me that high-quality data is the foundation of all successful analytics and decision-making. Ensuring that data is clean, accurate, and consistent is crucial to the system's success.

2. **Automation is Key**
   Building automated pipelines has become a critical part of my role. Automating data ingestion, transformation, and validation processes allows for more efficient workflows and reduces the risk of human error.
3. **Collaborating Across Teams**
   As a Data Engineer, collaborating closely with other teams—like IoT specialists, AI developers, and project managers—has been essential. Ensuring smooth data flow and integration across systems requires clear communication and shared objectives.
4. **Scalability and Performance**
   Ensuring that the system can scale to handle increasing amounts of data is a challenge I've encountered. I've learned the importance of designing data architectures that are both scalable and capable of maintaining high performance.
5. **Continuous Improvement**
   The world of data engineering is constantly evolving. I've come to understand the importance of staying up-to-date with new technologies, methodologies, and best practices in data processing, storage, and analysis.
6. **Security and Compliance**
   Data security and privacy are paramount. I've had to ensure that sensitive data is stored and processed in accordance with industry standards and regulations, which has further deepened my understanding of secure data handling.
7. **Understanding End-User Needs**
   As a Data Engineer, it's vital to not only focus on the technical aspects of data management but also understand how end-users interact with data. Ensuring that data is accessible and useful for decision-makers is a key part of my role.
8. **Efficiency in Data Flow**
   Optimizing data pipelines and ensuring that the flow of information is seamless and quick has been one of my major focuses. Efficient data transfer and processing directly impact the performance of the entire system.
9. **Problem Solving in Real-Time**
   With IoT devices continuously generating data, real-time processing is vital. I've learned to quickly address and resolve any data inconsistencies or issues as they arise, ensuring that the system remains operational without delays.
10. **Collaboration Drives Innovation**
    Working with a talented team of professionals from various fields has shown me that collaboration is key to driving innovation. We've been able to develop more efficient solutions through shared insights and collective problem-solving.

These insights shape how I approach my role as a Data Engineer and guide my efforts to contribute to the ongoing success of the Elysium project.

🖐 Get in Touch

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End with a bang! Some options are: "I am so grateful to be here at <Insert company name> and very excited to get started!" or "Looking forward to meeting all of you!" or "Can't wait to get to know all of you!"

🖌️UI/UX Designer

👏 Hi, my name is Minh Duy

NGUYEN MINH DUY - UI/UX

Hello everyone! My name is Minh Duy, though I also go by Mordred Nguyen. My pronouns are he/him. I'm an UI/UX designer joining from Ho Chi Minh City, Vietnam. Excited to be part of the team and looking forward to collaborating with you all!

🏛️ Overview

I'm Minh Duy (also known as Mordred Nguyen), a dedicated Software Engineering and AI student at Swinburne University of Technology, based in Ho Chi Minh City, Vietnam. I bring a unique mix of technical knowledge and design skills, with a strong passion for UI/UX design focused on creating intuitive, visually engaging digital experiences that enhance usability and overall user satisfaction. In this Smart Greenhouse project, I aim to leverage my skills to design a user-centered interface that enables greenhouse operators to effectively monitor and manage environmental conditions with ease.

As a UI/UX designer, I focus on translating complex data into clear, actionable insights through carefully structured dashboards, real-time data visualizations, and responsive interfaces. My role here combines visual design, user research, and data visualization with technical knowledge in software development, ensuring that every aspect of the greenhouse system's interface is optimized for a seamless user experience.

🗺️ Key Contributions

In my role on the Smart Greenhouse project, my primary contributions include:

1. **User-Centered Dashboard Design**: Developing an intuitive, centralized dashboard that provides users with a clear and organized interface to monitor key greenhouse metrics, including temperature, humidity, lighting, and CO_2 levels. I aim to make real-time data accessible and actionable, allowing users to make quick, informed decisions about their greenhouse conditions.
2. **Mobile App Accessibility and Responsiveness**: Creating a user-friendly mobile app interface that mirrors the dashboard's functionality, enabling users to remotely monitor and control greenhouse conditions from any location. This includes designing a layout that is consistent with the desktop interface, offering a seamless transition between devices.
3. **Data Visualization and Visual Hierarchy**: Using tools like Figma, Photoshop, and Adobe XD to create visual elements that highlight the most critical information, ensuring data is displayed in a way that is easy to interpret. I am focused on implementing a clear visual hierarchy, with the most essential metrics prominently displayed, empowering users to respond quickly to any environmental changes.
4. **Feedback and Alert Systems**: Designing a system of alerts, notifications, and feedback mechanisms that inform users of significant events or potential issues in the greenhouse environment. This includes real-time alerts for out-of-range conditions, helping users proactively manage and maintain optimal greenhouse settings.

Detailed Description of Major Work

As a UI/UX designer on the Smart Greenhouse project, my work encompasses several core activities:

1. **User Research and Persona Development**: To design an effective interface, I begin by conducting thorough user research, engaging directly with greenhouse operators to understand their needs, preferences, and challenges. This research is used to develop user personas that inform all aspects of the design process, ensuring the final product is closely aligned with real user requirements.
2. **Wireframing and Prototyping**: I create both low and high-fidelity wireframes to outline the structure and functionality of the dashboard and mobile app. These prototypes allow us to test layout ideas with users early in the process, gathering feedback to refine each aspect before moving on to full-scale design. This iterative approach ensures that the interface remains user-centered at every stage.
3. **User Interface (UI) Design**: Building on the feedback from wireframes, I create high-fidelity mockups that bring the dashboard and mobile app to life. This includes selecting colors, fonts, and icons that are not only visually appealing but also enhance usability. I focus on a clean, professional aesthetic that aligns with the project's purpose, with user-friendly navigation and clear data visualization.
4. **Usability Testing and Iteration**: I conduct usability testing sessions with a sample of target users, allowing us to observe how they interact with the interface. Based on their feedback, I make iterative adjustments to improve intuitiveness, streamline workflows, and remove any obstacles to efficient use.
5. **Data Visualization Strategy**: Translating complex environmental data into easily digestible visuals is a core part of my role. I use graphs, charts, and color-coded indicators to represent changes in temperature, humidity, and lighting, among other metrics. This approach empowers users to understand the greenhouse conditions at a glance, facilitating quick and confident decision-making.

Results and Achievements

Through my experience and role on previous projects, I have been able to contribute significantly to successful project outcomes:

1. **Genlogin Tool Development**: While working with Genlogin Software, I developed an automation tool that achieved over 1,000 downloads, securing a top-2 ranking in its category. This project helped me build essential skills in user-centered design and develop an understanding of what makes an interface successful in terms of usability and engagement.
2. **Enhanced User Experience in IELTS Training Platform**: I created an accessible, efficient digital interface for an IELTS training platform, which resulted in a 20% increase in user engagement. This experience has refined my ability to design interfaces that enhance learning and retain user interest through optimized usability.
3. **Stakeholder Feedback and Collaboration**: My design work has consistently received positive feedback from stakeholders, particularly for its clarity, intuitiveness, and ability to balance aesthetic appeal with functionality. Working closely with diverse teams, I have learned to incorporate insights from various disciplines, which has strengthened my problem-solving and design refinement abilities.

Future Contributions/Plans

Looking forward, I am excited to make continued contributions to the Smart Greenhouse project, including:

1. **User Experience Optimization**: I plan to continuously refine the interface based on ongoing user feedback, making it as intuitive and efficient as possible. This will involve tracking user interactions, analyzing pain points, and implementing updates that enhance the overall user experience.
2. **Incorporating Advanced Features**: Exploring the potential of AI to deliver predictive insights within the dashboard. By analyzing historical data, we could provide users with anticipatory guidance on environmental changes, helping them respond proactively.
3. **Increased Accessibility and Inclusivity**: Enhancing accessibility features such as adjustable text sizes, high-contrast modes, and screen reader compatibility. This will ensure the platform is usable for a wider range of users, including those with visual impairments or other accessibility needs.
4. **Integration with Emerging Technologies**: As IoT and AI evolve, I am committed to exploring new technologies and best practices that can further enhance the user interface and experience. This includes integrating features that allow users to personalize their dashboard, providing a tailored experience that meets specific operational needs.
5. **Building a Comprehensive Knowledge Base**: I aim to contribute to the project's documentation by creating user guides, tutorial videos, and FAQs. This will help new users onboard smoothly and fully leverage the system's capabilities, ultimately promoting wider adoption and long-term usability.

Personal Insights

Throughout my journey as a UI/UX designer, I have developed a few guiding principles that shape my approach to this project and beyond:

1. **Design with Purpose**: I believe every design element should serve a functional purpose. In a data-driven project like Smart Greenhouse, my goal is to ensure that every component of the interface is intuitive, useful, and contributes to a seamless user experience.
2. **Commitment to Continuous Learning**: With the rapid pace of advancements in technology and design, I am committed to lifelong learning. I stay current with emerging trends and tools, regularly experimenting with new techniques to bring fresh ideas to my work.
3. **User Empathy is Key**: Designing effective solutions requires understanding the end user's perspective. I am passionate about developing products that genuinely solve users' needs and strive to achieve this by actively engaging with users during all design phases.
4. **Balancing Functionality with Aesthetics**: I see design as a blend of art and science. An interface should not only look good but also be easy to use. My design philosophy emphasizes creating solutions that are visually pleasing yet highly functional.
5. **Collaboration Fosters Innovation**: Working on cross-functional teams has taught me the value of diverse insights. I am excited to collaborate with developers, engineers, and data scientists on this project, as their expertise will help me create a more robust and effective product.

🖐 Get in Touch

I would love to connect and discuss ideas further. Please feel free to reach out to me on LinkedIn or email me directly at mordred2005@gmail.com.

✉️ mordred2005@gmail.com.	🔗 TTMordred (@TtMordred) / X
💼 https://www.linkedin.com/in/mordred210/	👤

I am truly honored to be part of this project - Elysium , and I look forward to collaborating with each of you. Together, I am confident that we can create a user-friendly, innovative, and impactful Smart Greenhouse system that drives efficiency and sustainability. Let's make this vision a reality!

🤖AI Specialist

👋 Hi, my name is Phan Cong Hung

PHAN CONG HUNG - AI

Hello team! My name is Hung. I am honored to serve as the **AI Specialist for the Elysium Project**, where we are transforming the way agriculture embraces technology with our IoT-controlled Smart Greenhouse System. This system aims to revolutionize crop production by leveraging real-time data, machine learning, and AI to achieve optimized growing conditions with a focus on sustainability and efficiency. I am thrilled to collaborate with such a talented and innovative team and look forward to learning and growing together as we work toward the impactful and ambitious goals we have set.

🔑Key Contributions

As the AI Specialist on the Elysium Project, my contributions focus on:

- **Innovative AI Model Development**: I lead the design and deployment of AI models that optimize critical aspects of greenhouse management, including climate control and predictive maintenance.
- **Data Engineering and Pipeline Management**: Working with our data engineers, I ensure efficient data flow and real-time analytics to maintain model accuracy.
- **Cross-Functional Collaboration**: I liaise with IoT and software engineering teams, ensuring seamless integration between AI components and hardware for smooth operations.
- **User-Centric Design and Insightful Output**: I prioritize delivering actionable insights to end users, designing models that simplify complex data and support intuitive decision-making.

📃Detailed Description of Major Work

1. **AI Model Development and Optimization**: I develop and refine AI models that continuously monitor environmental factors such as temperature, humidity, and lighting. These models enable automated control of greenhouse systems and are fine-tuned to provide high accuracy and efficiency.
2. **Data Pipeline Design and Management**: Working closely with the data team, I set up data pipelines that support real-time input from IoT sensors and provide continuous feedback to AI models. This ensures that our system operates with the most up-to-date information for optimal outcomes.
3. **Predictive Analytics and Proactive Decision Support**: I focus on creating predictive models that allow the system to anticipate equipment needs, forecast crop yields, and detect potential issues. These insights enable proactive maintenance and improved planning for users.
4. **Integration with IoT and Engineering Components**: I coordinate with the IoT and engineering teams to ensure the seamless integration of AI models with hardware. This creates a unified system where data flows effortlessly from sensors to analytics, enabling real-time adjustments.
5. **User Experience Design**: A major focus is on delivering AI insights in a way that is meaningful and accessible for users. I work to ensure that output metrics and visualizations are easy to interpret, enabling greenhouse operators to make informed decisions based on clear, actionable data.

6. **Quality Control and Iterative Improvement**: Every model undergoes rigorous testing and continuous refinement. I monitor performance metrics and incorporate user feedback to keep models adaptive to evolving conditions and user needs.

🏆Results and Achievements

My work on the Elysium Project has led to several notable achievements:

- **Enhanced System Efficiency**: By leveraging AI-driven climate control and predictive maintenance, I have helped to reduce energy and resource consumption while maintaining optimal growing conditions.
- **Improved User Experience**: Through user-centered design, I have simplified complex data outputs, making the AI insights more actionable for greenhouse operators and enabling better decision-making.
- **Early Detection and Proactive Maintenance**: The predictive models I've developed have enabled early identification of equipment and crop issues, reducing downtime and enhancing crop health.
- **Collaboration-Driven Innovation**: My work with the IoT and engineering teams has helped foster a collaborative environment that has been key to the system's integrated success.

🤝Future Contributions/Plans

Looking forward, I have several plans to advance the Elysium Project:

1. **Expand Predictive Capabilities**: I plan to enhance our predictive models for areas like disease detection, yield forecasting, and climate adaptation, keeping our system at the cutting edge of AI in agriculture.
2. **Enhance Data Scalability**: As data volumes grow, I am committed to scaling our data processing infrastructure, ensuring our system remains robust and efficient.
3. **Improve Resource Efficiency**: I will continue to refine models to reduce resource consumption, aligning with our mission to promote sustainable farming.
4. **Broaden System Interoperability**: By expanding compatibility with other farm management platforms, I aim to make Elysium's AI system interoperable, broadening its utility across the agriculture ecosystem.

👁️Personal Insights

This journey with Elysium has provided me with valuable insights:

- **Power of Cross-Functional Collaboration**: Working alongside experts in IoT and engineering has deepened my appreciation for interdisciplinary teamwork.
- **Commitment to Sustainability**: This project has reinforced my dedication to creating technologies that support environmentally sustainable agriculture.
- **User-Centered Design in AI**: Elysium has taught me the importance of designing AI solutions that are accessible, focusing on delivering practical, user-friendly insights.
- **Adaptability and Continuous Growth**: The dynamic nature of this project has encouraged me to stay flexible and embrace new learning opportunities.

🖐️ Get in Touch

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💼 Cong Hung Phan | LinkedIn 👤

Can't wait to get to know all of you!

📱Product Deliverable

Overview

Our project, Elysium, aims to deliver cutting-edge solutions that enhance greenhouse management and optimize agricultural productivity. The key deliverables of our project include a comprehensive **website** and an intuitive **dashboard**, each serving distinct but complementary purposes. Below, we detail these deliverables and their unique features and benefits.

Products/Applications

1. Website

Overview:

The project website serves as the primary interface for information dissemination and user engagement. It acts as a central hub for users to access essential data, interact with the Smart Greenhouse system, and gain insights into various functionalities.

Key Features:

- **User Authentication**: Secure login and account management to ensure that only authorized users have access to the system.
- **Real-Time Updates**: Users receive up-to-date information on the greenhouse's environmental status, system alerts, and overall performance.
- **Comprehensive Resources**: Informative content about the Elysium project, including user manuals, FAQs, and support channels for troubleshooting.
- **Responsive Design**: A user-friendly experience across devices, ensuring accessibility and convenience whether accessed via desktop, tablet, or smartphone.

Benefits:

- Centralized access to manage and monitor the greenhouse system.
- An educational platform for users to learn about the innovative technologies used within the project.
- Provides stakeholders and partners with valuable insights into project progress and features.

2. Dashboard

Overview:

The dashboard is designed as the operational command center for managing and monitoring the greenhouse's real-time activities. It allows users, such as farmers, technicians, and administrators, to interact seamlessly with data collected from IoT sensors and AI models.

Key Features:

- **Data Visualization**: Interactive charts, graphs, and analytics provide a visual representation of data, making it easier to interpret and act on.
- **Real-Time Monitoring**: Users can track essential metrics such as temperature, humidity, CO_2 levels, and soil moisture, updated continuously to reflect current conditions.
- **Control Panel**: The dashboard enables users to manually adjust settings, override automated processes, and issue commands to the control system for managing actuators.
- **Alerts and Notifications**: Integrated alert functionality to notify users of critical conditions that require immediate attention, enhancing proactive management.
- **User Role Management**: Administrators can assign roles and permissions to different users, ensuring that each user has the appropriate level of access.

Benefits:

- Empowers users to make data-driven decisions to optimize crop growth and resource efficiency.
- Facilitates preventive action by notifying users of potential issues before they escalate.
- Enhances operational transparency, making it easier for multiple stakeholders to collaborate and manage greenhouse activities effectively.

Conclusion:

Our deliverables—the **website** and **dashboard**—are designed to work in harmony, ensuring that users have a robust and seamless experience when managing their greenhouse operations. Together, they serve to streamline processes, enhance productivity, and support sustainable agricultural practices through advanced technology and intuitive design.

Elysium Website

Welcome to Elysium’s Official Website

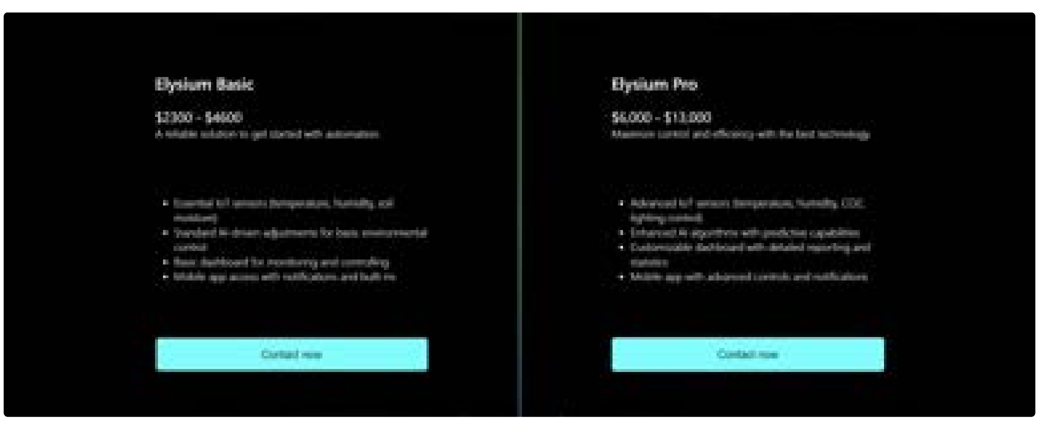
Welcome to Elysium's official website. Here, you can discover our innovative solutions in smart agriculture, explore the technology behind our services, and stay informed about the latest developments. Whether you're a farmer, researcher, or enthusiast, our platform is designed to provide you with an exceptional user experience, enabling you to interact with our services seamlessly.

Website Design & Features

Our Home Page

Our Vision

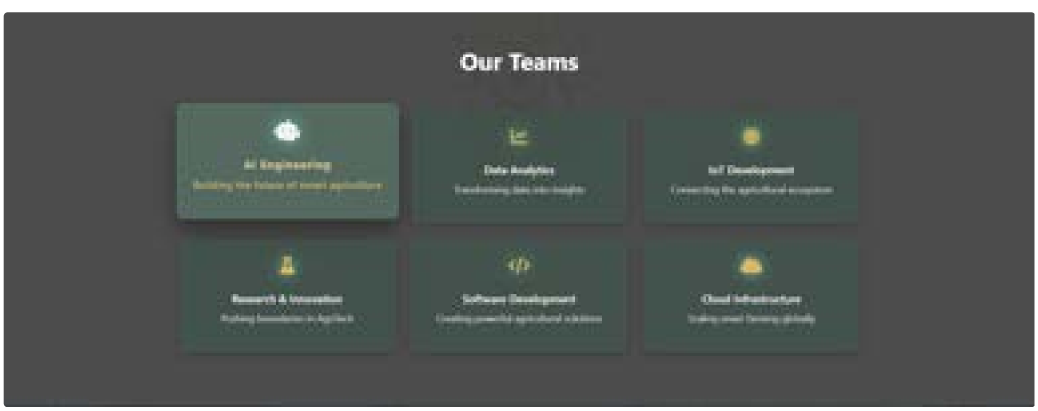
Join Us, Elysium Elite



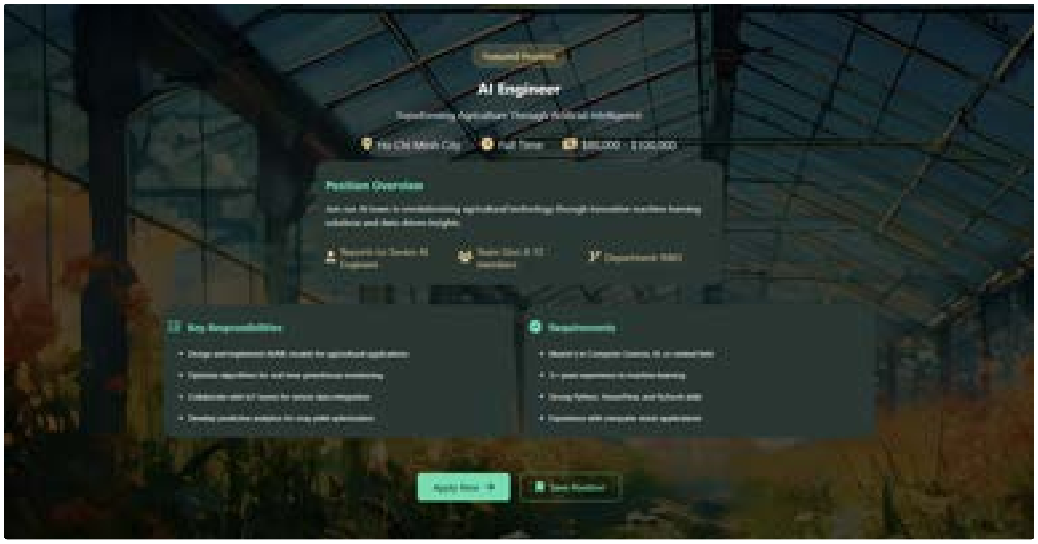
Our Services

Why choose us?

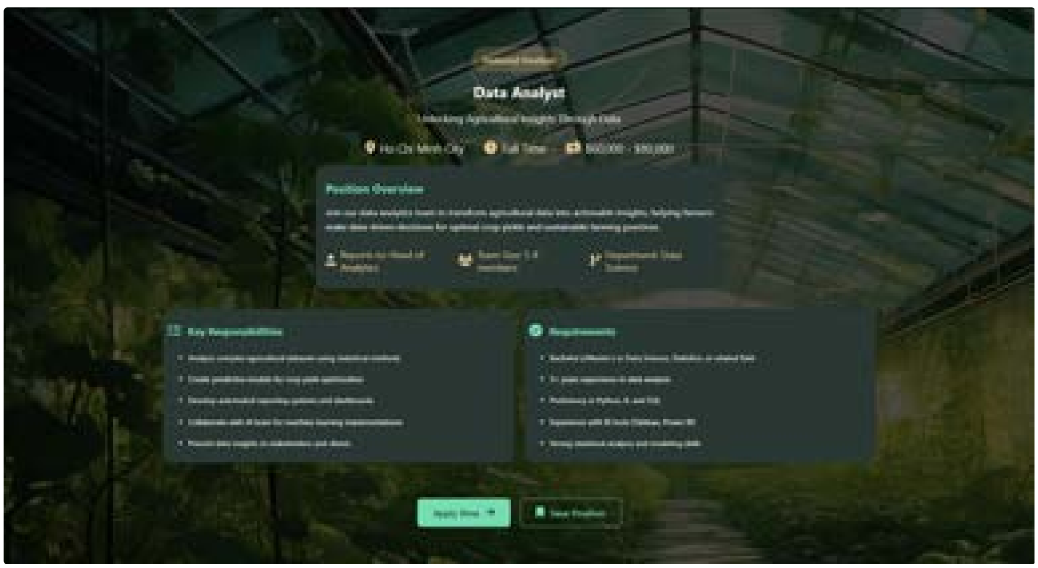
Our Jobs Page



Our Teams



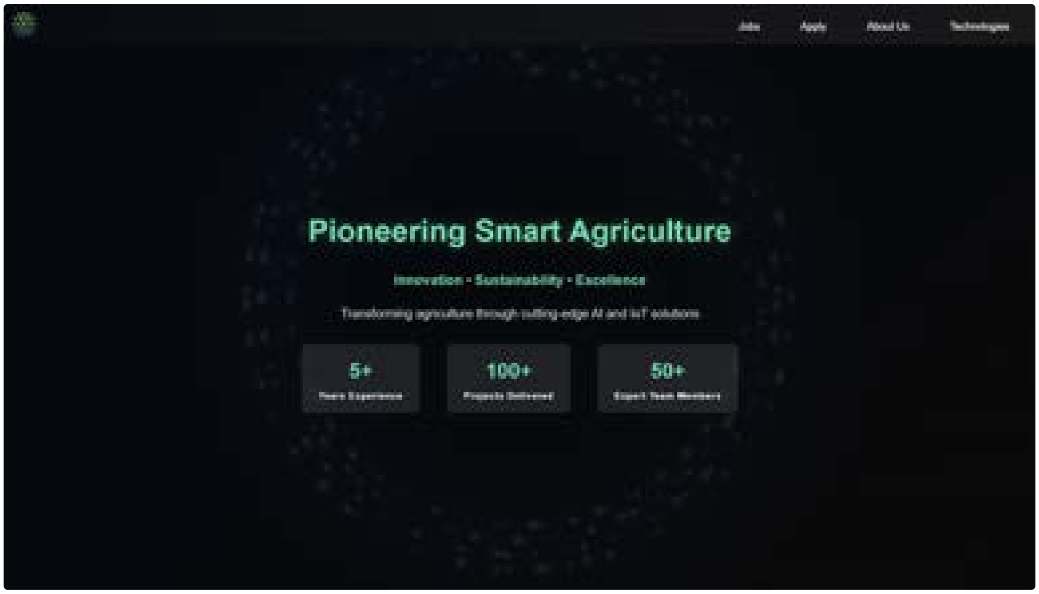
AI Engineer



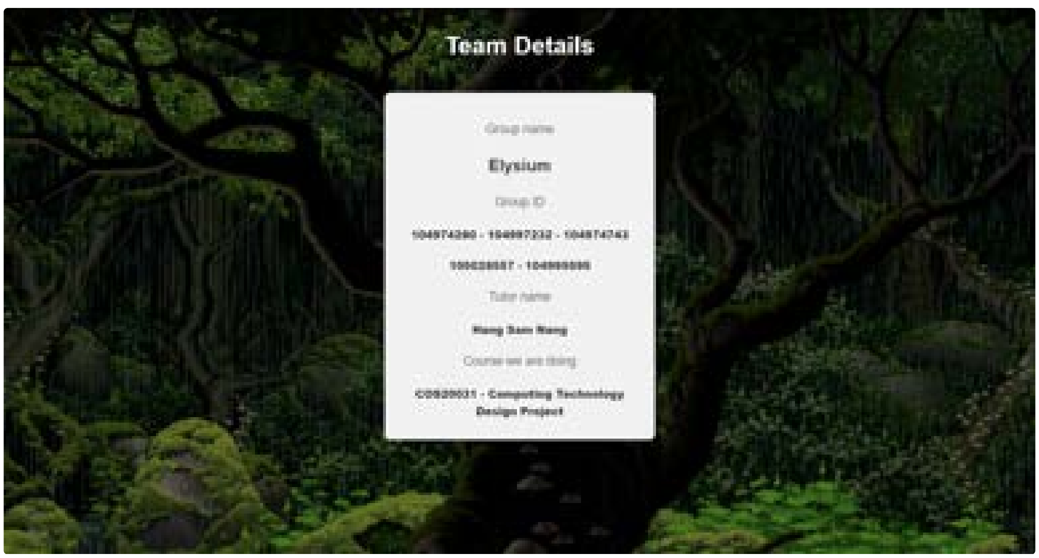
Data Analyst

Our Apply Page

“Join us not to be a part…”

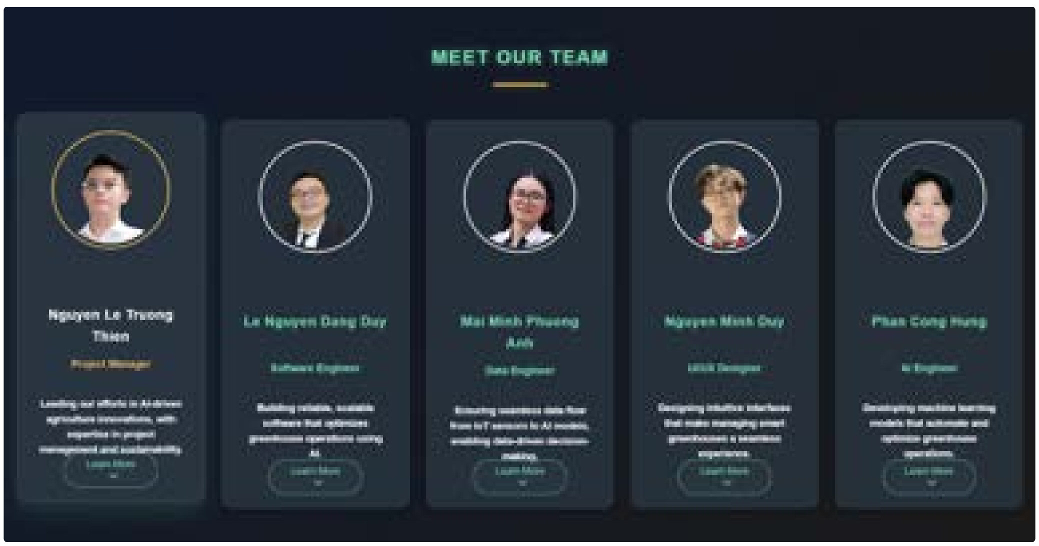


Our About Page



Our Team Details

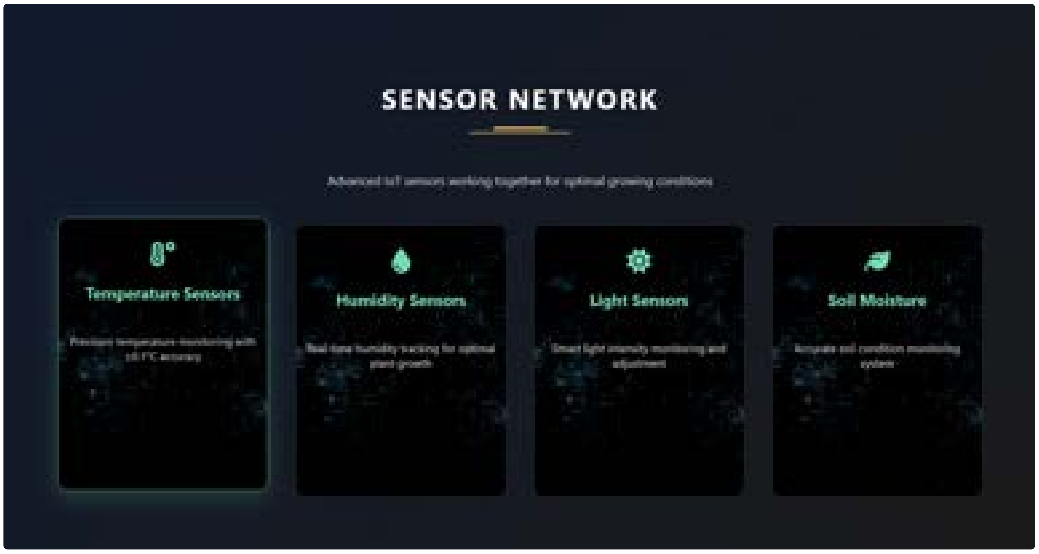
Our Technologies



Meet Our Team

Our Technologies Page

Our Dashboard App



Our Sensor Network

Temperature and Humidity Sensors

Light Intensity Sensors

Explore Elysium

📶Elysium Dashboard

Overview

The **Elysium Greenhouse Dashboard** is an advanced web-based application that offers real-time monitoring, data analysis, and management capabilities for greenhouse operations. The platform is designed with a user-friendly interface that supports seamless navigation and ensures that users have access to all essential features to optimize greenhouse management. This report provides a detailed breakdown of each page of the dashboard and its functionalities, tailored for stakeholders to understand the depth and value of the product.

1. Login Page

Login page

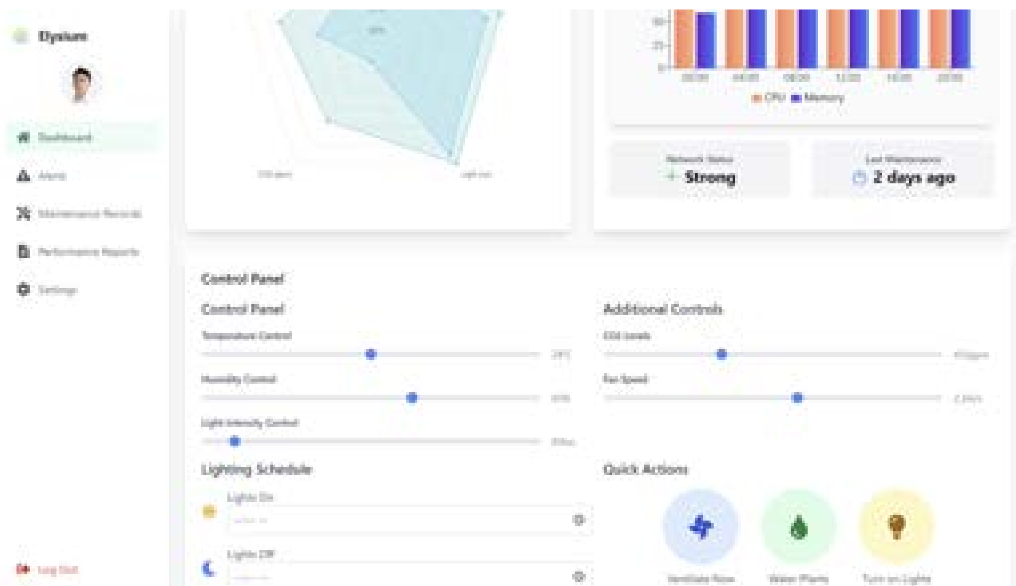
Functionality: The **Login Page** serves as the secure gateway for users to access the Elysium Dashboard. It incorporates a modern and minimalist design, featuring fields for email and password entry, along with options such as "Remember me" and "Forgot password?". The background is complemented by an abstract, visually appealing design, which aligns with the brand's identity.

Features:

- **Email and Password Fields**: For user authentication.
- **Remember Me Option**: Ensures ease of access during subsequent logins.
- **Forgot Password**: Facilitates quick recovery for users who have misplaced their credentials.
- **Aesthetic Appeal**: Balances functionality with visual engagement through a colorful, yet unobtrusive background.

2. Main Dashboard Page

Dashboard page - First view



Dashboard page - Second view

Dashboard page - Third view

Functionality: The Main Dashboard serves as the comprehensive control center for greenhouse operators, offering real-time insights into key environmental and operational metrics. The page combines interactive elements, data visualization, and direct control features, enabling users to monitor, analyze, and manage their greenhouse systems effectively.

Features:

2.1 Overview Cards:

- **Temperature Card**: Displays the current temperature within the greenhouse, updated in real-time. It features a trend indicator (+/-) that shows changes from the last recorded data. Color-coded feedback (green for optimal, orange for caution, and red for critical levels) helps users quickly assess the status.
- **Humidity Card**: Shows real-time humidity levels as a percentage, complete with an arrow to denote upward or downward trends. The card provides immediate insight into whether the greenhouse maintains moisture levels suitable for the crops.
- **Light Intensity Card**: Indicates current light levels in lux and highlights whether the intensity is within the preferred range for plant photosynthesis. A numerical change from previous readings and a visual marker for "high," "normal," or "low" are provided.
- **CO2 Levels Card**: Displays CO2 concentration in parts per million (ppm) and signals when levels shift into potentially harmful ranges. Green highlights signify safe levels, while yellow and red indicate warnings or critical values.
- **Air Flow Card**: Monitors the current airflow in meters per second, essential for ventilation and maintaining a balanced environment. The card's trend marker helps assess if airflow changes are needed.

Each card is designed to quickly convey information and allow users to prioritize actions without needing to delve deeper into data logs.

2.2 Environmental Trends Chart:

- **Interactive Line Graph**: Visualizes historical data for temperature, humidity, and light intensity throughout the day, offering a clear view of how these metrics fluctuate over time.
- **Dynamic Date Range Selector**: Users can adjust the timeframe to view data for specific periods (e.g., last 24 hours, past week) to track trends or pinpoint specific incidents.
- **Hover-Over Data Points**: Users can hover over the graph's data points to reveal exact measurements and timestamps, enabling detailed analysis of critical events or changes in conditions.
- **Color Differentiation**: Each environmental factor is represented by a distinct color line for easy identification—blue for temperature, green for humidity, and yellow for light intensity.

2.3 System Performance Metrics:

- **System Uptime**: A circular progress chart that shows the percentage of time the system has been fully operational over a designated period. This metric ensures users are aware of any interruptions that may affect greenhouse functionality.

- **Sensor Health**: Another progress chart that indicates the overall health of all active sensors in the greenhouse. A dip in sensor health suggests potential maintenance needs or malfunctioning sensors, prompting preemptive checks.

2.4 User-Friendly Navigation:

- **Sidebar with Quick Links**: The left-hand sidebar includes icons and links to essential sections of the platform:
  - **Dashboard**: Main hub for current operations.
  - **Alerts**: Notifications and warnings about environmental and system conditions that need attention.
  - **Maintenance Records**: A log of past and scheduled maintenance activities, keeping users informed of completed and pending tasks.
  - **Performance Reports**: Access to detailed reports summarizing environmental metrics, system performance, and historical data for deeper analysis.
  - **Settings**: Personalize system settings, user profiles, and general dashboard preferences.

2.5 Quick Action Controls:

- **Ventilate Now**: A clickable button that activates the greenhouse's ventilation system to improve air circulation when CO_2 levels or temperature exceed optimal ranges.
- **Water Plants**: A one-touch control for initiating the irrigation system, ensuring timely watering when humidity drops below the required threshold.
- **Turn on Lights**: Instantly powers the greenhouse lighting system, allowing users to supplement natural light during low-light periods or specific growth phases.

2.6 Lighting Schedule Configuration:

- **Adjustable Timers**: Users can set precise times for lights to turn on and off, automating light cycles that align with the crops' photoperiod requirements.
- **Manual Override**: A feature that allows users to bypass scheduled settings to accommodate unexpected changes or experiments with light exposure.

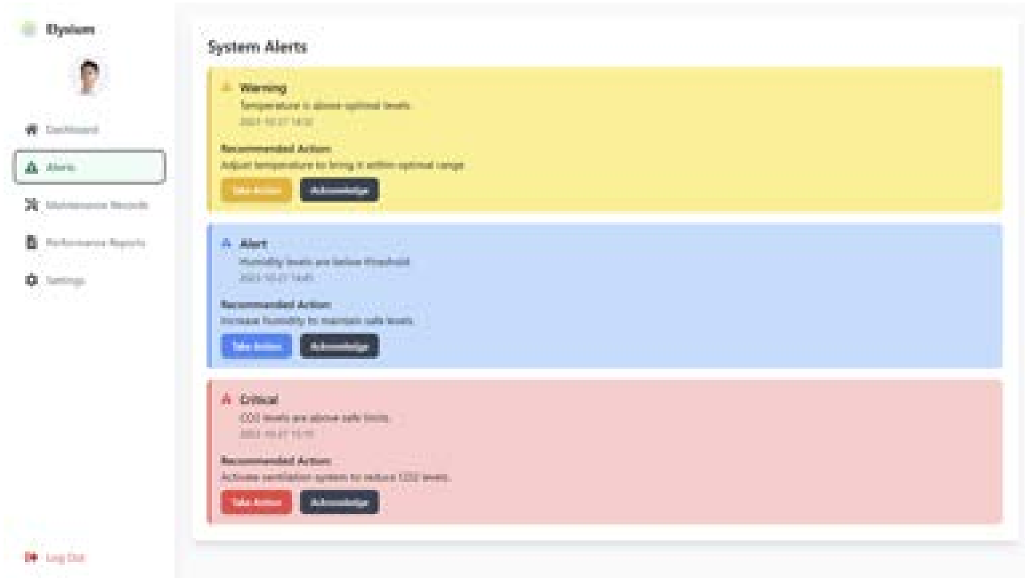
2.7 Additional System Insights:

- **Network Status Indicator**: Real-time feedback on connectivity strength ensures users know if the system is fully connected or experiencing disruptions.
- **Last Maintenance Summary**: Displays the last recorded maintenance activity to help users track recent service updates and plan future maintenance schedules effectively.

2.8 Customizable Interface Modes:

- **Light Mode**: Provides a bright, clean interface that is easy on the eyes during daytime use, enhancing readability.
- **Dark Mode**: Offers a sleek, high-contrast design ideal for low-light conditions, reducing eye strain and enhancing focus on critical data.

3. Alerts Page



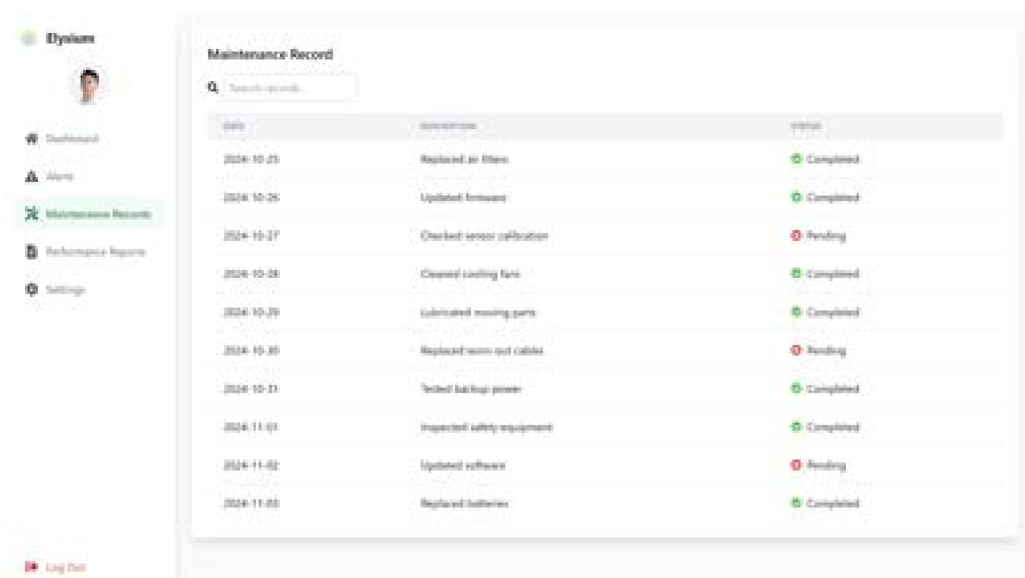
Alerts page

Functionality: The **Alerts Page** is designed to inform users about any significant deviations or critical conditions in greenhouse parameters. Each alert is categorized based on its urgency, making it easier for users to prioritize their actions.

Features:

- **Alert Types**: Warnings, alerts, and critical notifications are differentiated by color coding (e.g., yellow for warnings, blue for alerts, and red for critical conditions).
- **Detailed Information**: Each alert card includes a description of the issue, the time it was generated, and a recommended course of action.
- **Quick Actions**: Users can acknowledge an alert or take corrective measures directly from the alert card through action buttons like "Take Action" and "Acknowledge".

4. Maintenance Records Page



Maintenance Records page

Functionality: The **Maintenance Records Page** logs all completed and pending maintenance activities related to the greenhouse. This section ensures that stakeholders have a clear history of equipment servicing, repairs, and updates.

Features:

- **Date and Description**: Each entry is timestamped and includes a brief description of the maintenance task performed.
- **Status Indicators**: Tasks are marked as "Completed" or "Pending," with color-coded icons to visually distinguish between them.
- **Search Function**: A search bar allows users to quickly locate specific maintenance records for review or audit purposes.

6. Performance Reports Page

Performance Reports page - First view

Performance Reports page - Second view

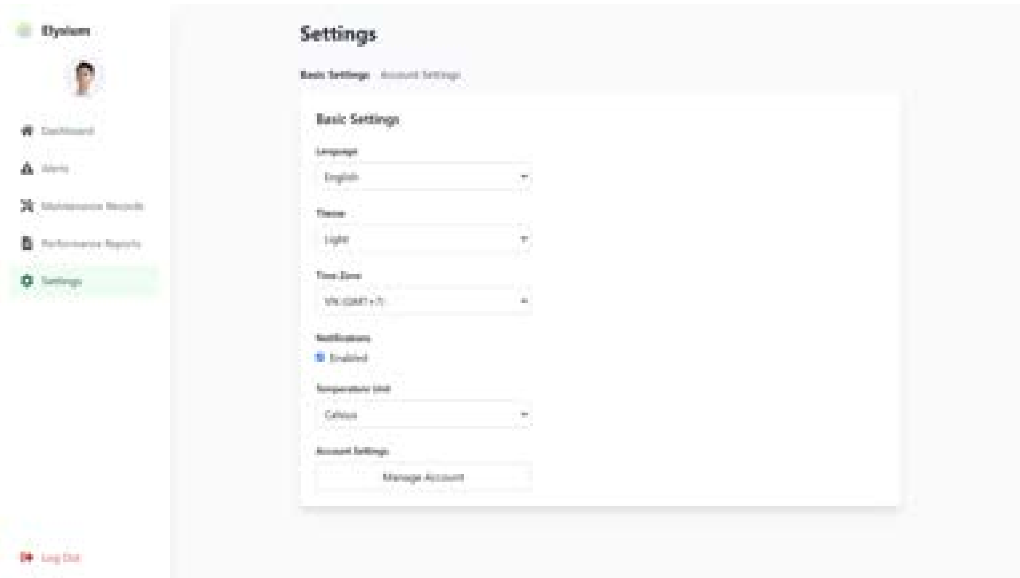
Functionality: The **Performance Reports Page** allows users to generate, review, and print detailed reports of greenhouse performance over different time frames. This page is particularly useful for data analysis and long-term strategy planning.

Features:

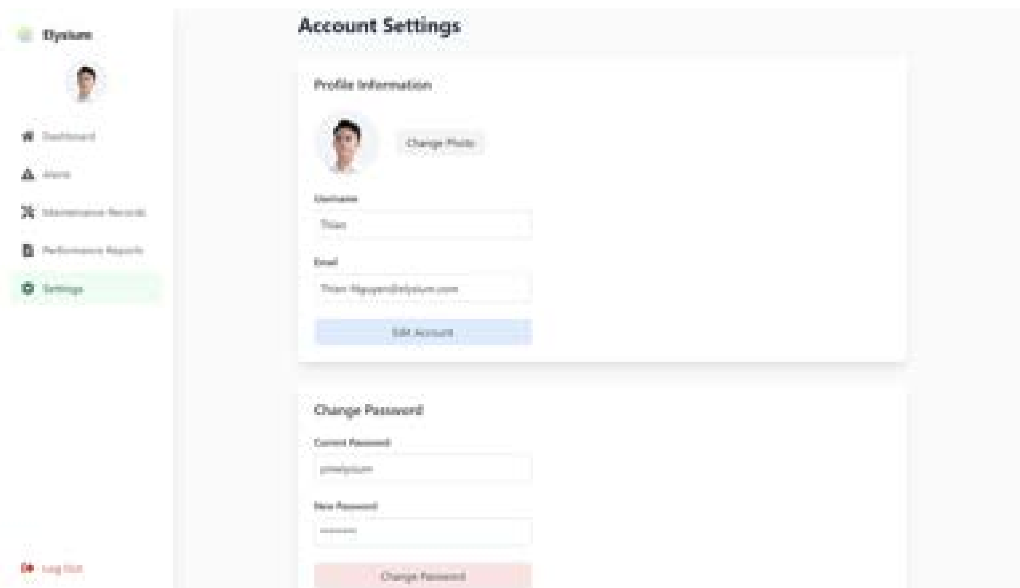
- **Monthly Performance Data**: Displays monthly data for temperature, humidity, and light intensity in a tabular format.
- **Statistics Section**: Summarizes key metrics such as average, maximum, and minimum readings for each monitored parameter.

- **Generate PDF and Print Options**: Users can create PDF reports or print performance data directly from the dashboard for external reviews or documentation purposes.

7. Settings Page



Settings page - Basic Settings



Settings page - Account Settings

Functionality: The **Settings Page** enables users to customize their dashboard experience, manage their profile, and adjust system preferences.

Features:

- **Basic Settings**: Includes options to change the language, theme (light or dark mode), time zone, and notification settings.
- **Account Management**: Users can view and update their profile information, such as username and email, and manage their password for enhanced security.
- **User Experience Customization**: Options to toggle between light and dark modes based on user preference, providing comfort for different working conditions.

8. Dark and Light Mode Feature

Dark mode

Overview: The **Dark Mode** and **Light Mode** options cater to user comfort and usability. Dark Mode reduces eye strain during low-light conditions and provides a sleek, modern interface, while Light Mode is ideal for well-lit environments and offers a clean, traditional view.

Features:

- **Seamless Switching**: Users can toggle between modes instantly without refreshing the page or impacting their workflow.
- **Consistent Design**: Both modes maintain the dashboard's functional and aesthetic integrity, ensuring a high-quality user experience regardless of the setting.

Conclusion

The **Elysium Greenhouse Dashboard** is a comprehensive tool that not only simplifies the monitoring and management of greenhouse conditions but also empowers users with actionable insights and easy-to-use features. Each page has been meticulously designed to enhance user engagement, support decision-making, and streamline operations for all types of greenhouse stakeholders. This dashboard embodies a robust, scalable solution for optimizing greenhouse productivity and sustainability.

4Ls Retrospective

📋 Overview

Reflect back on what you and your team learned and what motivates the group to succeed by following the instructions for the 4Ls Retrospective Play.

Team	Team 2 - Elysium
Team members	@LE TRUONG THIEN NGUYEN @MINH PHUONG ANH MAI @NGUYEN DANG DUY LE @MINH DUY NGUYEN @CONG HUNG PHAN
Date	Thu, Nov 07, 2024
Retrospective period	Fall Semester (Sep - Nov) 2024

💭 4Ls retrospective

Milestones	**Loved**	**Longed for**	**Loathed**	**Learned**
	❤️List what you loved about your work	✨List what you wished you had while working	👎List what you didn't like about your work	🧠List what you learned
Milestone 1: Project Kickoff and Requirement Gathering	@LE TRUONG THIEN NGUYEN : The initial enthusiasm and participation from everyone were motivating.	@LE TRUONG THIEN NGUYEN : It would have been helpful to receive more detailed feedback from stakeholders earlier in the process. Their input would have guided key decisions, identified potential issues,	@CONG HUNG PHAN : At times, discussions seemed to revisit similar points, and there were moments when the overall direction wasn't as clear to me.	@MINH PHUONG ANH MAI : Gathering requirements clarified how the AI models must adapt to real-time data variability.

		and ensured the project aligned better with everyone's needs, ultimately improving planning and reducing later revisions.		
Milestone 2: Designing the Conceptual ERD	@MINH PHUONG ANH MAI : Conceptualizing entities and their relationships was essential to planning the data flow and storage properly. @NGUYEN DANG DUY LE : The process was essential for understanding how the backend will handle and interact with data, laying the groundwork for effective data flow, system communication, and ensuring data integrity for a scalable architecture.	@MINH PHUONG ANH MAI : We should have considered more scalable database models to handle larger datasets.		@CONG HUNG PHAN : This phase clarified how the AI will extract meaningful patterns from structured data.
Milestone 3: Setting Up IoT Sensors	@CONG HUNG PHAN : IoT sensors collecting real-time data provided valuable input for AI models.	@NGUYEN DANG DUY LE : We could have implemented a more robust API for real-time data synchronization. @MINH DUY NGUYEN : A clearer integration plan between the sensor output and the dashboard would enhance usability by ensuring seamless data flow,	@MINH DUY NGUYEN : Understanding the raw data from IoT devices was challenging due to its complexity and large volume. It required specialized knowledge to interpret the data, filter out noise, and extract meaningful insights for informed decision-making.	@CONG HUNG PHAN : Calibration emphasized the importance of clean, accurate data, as it directly impacts system reliability, reduces errors, and ensures optimal performance for accurate insights and decision-making.

		improving user experience, and making the system more intuitive and responsive.		
Milestone 4: Developing the AI Model	@CONG HUNG PHAN : Designing the model architecture and refining it through iterations was an exciting process. Each phase provided valuable insights, allowing for continuous improvements in efficiency, accuracy, and scalability, resulting in a more robust and effective solution.	@NGUYEN DANG DUY LE : I would suggest early collaboration between AI and software to ensure model integration is seamless.	@CONG HUNG PHAN : Dealing with biased datasets required significant preprocessing efforts.	@MINH PHUONG ANH MAI : This milestone highlighted the crucial role that high-quality labeled datasets play in achieving accuracy, underscoring their importance in training models effectively and ensuring reliable outcomes.
Milestone 5: Testing the First Prototype	@LE TRUONG THIEN NGUYEN : Testing allowed us to evaluate our progress and identify gaps early. @MINH DUY NGUYEN : Prototyping allowed me to visualize system functionality and refine the interface by simulating real user interactions, gathering feedback, and addressing usability issues early to improve both design and user experience.	@MINH DUY NGUYEN : The interface should dynamically adapt to errors identified during testing by providing clear feedback, visual cues, or automatic corrections, improving usability and ensuring a smoother, more reliable user experience.	@CONG HUNG PHAN : Allocating extra time for unexpected issues during the testing phase is crucial, as it allows teams to address unforeseen challenges, troubleshoot technical problems, and ensure thorough validation without affecting the overall project timeline.	@LE TRUONG THIEN NGUYEN : Allocating extra time for unexpected issues during the testing phase is crucial, as it allows teams to address unforeseen challenges, troubleshoot technical problems, and ensure thorough validation without affecting the overall project timeline.
Milestone 6: Creating the Logical ERD	@MINH PHUONG ANH MAI : This stage is aligned with optimizing the data structure for	@CONG HUNG PHAN : I recommend adding dedicated fields for training data logs to		@NGUYEN DANG DUY LE : It became evident how database normalization

	machine learning workflows.	improve the system's robustness. These logs would provide transparency, track data sources and preprocessing steps, and help identify issues like inconsistencies or biases, ultimately supporting better debugging, optimization, and model performance.		improves performance and scalability.
Milestone 7: Integrating the DFD	@LE TRUONG THIEN NGUYEN : The DFD helped communicate the system's workflow effectively to stakeholders. @MINH PHUONG ANH MAI : Seeing real-time data flow through our pipelines for the first time was exhilarating.	@MINH DUY NGUYEN :The DFD should include specific user interaction points for better clarity.		@CONG HUNG PHAN : Visual mapping of processes clarified the dependencies between modules, highlighting critical paths and potential bottlenecks. This approach improved communication, troubleshooting, and decision-making by providing a clear understanding of system interactions and helping teams address issues more efficiently. @MINH PHUONG ANH MAI : This emphasized the need for robust error-handling mechanisms to ensure system resilience and reliability. Effective error handling, including clear messages, automatic retries, and detailed logs, helps address

				issues quickly and improves overall stability and user experience.
Milestone 8: Deploying the Physical ERD and iterating on Backend Systems	@MINH DUY NGUYEN : Finalizing the schema made backend integration smoother and more predictable.	@CONG HUNG PHAN : Prioritizing backup mechanisms for critical tables is essential to protect data integrity and ensure quick recovery from system failures or accidents. Regular, automated backups should be secure, easily accessible, and tested to ensure reliability and alignment with disaster recovery plans, minimizing downtime and maintaining data availability. @NGUYEN DANG DUY LE : Greater collaboration with the AI and UI/UX teams during this phase would improve integration by ensuring that AI features are intuitively represented in the user interface. Real-time feedback between the teams would optimize both performance and user experience, leading to a more efficient development process and a product that meets both functional and		@MINH PHUONG ANH MAI : Deploying the database revealed how minor structural adjustments can significantly impact performance.

		user engagement goals.		
Milestone 9: Integrating AI Models into the System	@CONG HUNG PHAN : Watching the AI seamlessly predict outcomes based on live data was a major milestone.	@MINH PHUONG ANH MAI : Optimizing the models for edge-case scenarios is essential for ensuring robustness in rare or unforeseen conditions. By refining the models to handle extreme or unusual inputs, we can improve system stability, reduce errors, and enhance performance in unpredictable situations, ultimately boosting reliability and user trust.		@CONG HUNG PHAN : Deployment challenges emphasized the need for extensive cross-team testing.
Milestone 10: UI/UX Testing and Refinement	@MINH DUY NGUYEN : User feedback helped fine-tune the interface, making it more intuitive.		@MINH DUY NGUYEN : Some suggestions were technically unfeasible, leading to user frustration as they encountered limitations preventing full system utilization. These unrealistic expectations, due to overlooked technical constraints, caused dissatisfaction. Addressing feasibility early on would have helped set more realistic expectations and improved the overall user experience.	@LE TRUONG THIEN NGUYEN : This phase showed how small design improvements can significantly enhance user satisfaction.

Milestone 11: Comprehensive System Testing	@LE TRUONG THIEN NGUYEN : Running the system end-to-end validated our months of hard work.	@LE TRUONG THIEN NGUYEN : Integrating more automated testing tools would speed up the process by reducing manual effort and increasing test frequency and consistency. These tools can quickly identify bugs, validate functionality, and ensure broader coverage, leading to faster iterations, improved code quality, and a more reliable final product.		@CONG HUNG PHAN : Testing highlighted the importance of planning for unexpected data anomalies, as they can disrupt system accuracy and performance. By anticipating issues like outliers or missing data and implementing strategies for validation and error handling, the system can maintain reliability and accuracy, preventing disruptions and ensuring user trust.
Milestone 12: Performance Optimization	@CONG HUNG PHAN : Fine-tuning algorithms to maximize efficiency was both challenging and rewarding.	@MINH PHUONG ANH MAI : Implementing automated performance testing early in development would help identify potential issues quickly, such as bottlenecks or scalability problems. This proactive approach enables faster resolution, optimizes system performance, and ensures a stable, responsive product for users.		@MINH PHUONG ANH MAI : Optimizing performance showcased the need for continuous monitoring and improvement.
Milestone 13: Project Handover and Documentation	@NGUYEN DANG DUY LE : Documenting my work gave me a deeper appreciation for the complexity of the	@NGUYEN DANG DUY LE : A structured approach to documentation from the beginning	@LE TRUONG THIEN NGUYEN : With the project handover, I feel there are still a few areas that could	@MINH DUY NGUYEN : Writing detailed user guides highlighted the importance of accessibility for a positive user

	project, highlighting the detailed steps, decisions, and solutions that contributed to its success. It reinforced the significance of each contribution in achieving the final outcome. @MINH PHUONG ANH MAI : The documentation is complete, and it's clear how the data pipeline integrates with the rest of the system. I'm confident it will be easy for others to follow.	would have saved time.	have used more attention. The documentation is almost complete, but there are some details that need further refinement. The system is functional, but some final adjustments could improve its overall readiness.	experience. It emphasized the need for clear, simple instructions and visual aids to ensure that all users, regardless of skill level, can easily navigate and engage with the system. @CONG HUNG PHAN : I've learned a lot about the challenges of integrating AI with IoT devices. It highlighted the importance of optimizing models for real-world use and refining them throughout the process.

⚡ Action plan

Action	Owner	Due date	Action items
Amplify effective project planning and team dynamics.	@LE TRUONG THIEN NGUYEN	Nov 23, 2024	1. Consider adopting methodologies like Agile or Six Sigma to emphasize organized workflows, continuous improvement, and creative problem-solving. 2. Encourage regular team meetings or scrums to gather diverse ideas for problem-solving.
Amplify enthusiasm for logistics and the excitement of diving into a new project.	@CONG HUNG PHAN	Nov 23, 2024	1. Organize specialized training or workshops for the team. 2. Invest time in exploring and learning about cutting-edge technologies relevant to AI in collaboration with industry partners.

Prevent misunderstandings by enhancing team communication.	@MINH PHUONG ANH MAI	Nov 23, 2024	1. Establish clear communication protocols. 2. Encourage open discussions, feedback loops, and assign specific roles to ensure clarity and efficiency in team communication.
Enhance meeting efficiency and clearer requirement expectations.	@LE TRUONG THIEN NGUYEN	Nov 23, 2024	1. Facilitate productive meetings with clear criteria, adopting strategies like the "SMART" criteria (Specific, Measurable, Achievable, Relevant, Time-bound). 2. Introduce meeting agendas and timeboxing discussions.
Amplify the culture of weekly review sessions and mentorship.	@MINH DUY NGUYEN	Nov 23, 2024	1. Use a mentorship model as a blueprint and organize specialized workshops where industry experts or senior members of the team share insights, industry trends, and practical approaches.
Improve self-time-management skills to adapt to the team schedule.	@NGUYEN DANG DUY LE	Nov 23, 2024	1. Set priorities (sort to-do list daily) and create schedules using tools like Google Calendar, then share them with the project manager.
Amplify the setup of a cohesive team workspace and completion of stakeholder analysis.	@MINH PHUONG ANH MAI	Nov 23, 2024	1. Create simulated scenarios or role-playing exercises for team practice. 2. Encourage direct interactions with clients or set up channels for regular

			feedback sessions to continuously gather client insights.
Long for more opportunities to communicate with clients for their insights.	@CONG HUNG PHAN	Nov 23, 2024	1. Design a communication strategy that includes regular check-ins, surveys, or scheduled meetings. 2. Categorize communication channels and provide suitable communication protocols.
Assist ERD development and expedite the process.	@NGUYEN DANG DUY LE	Nov 23, 2024	1. Research and implement specialized ERD software or tools beyond Flowchart Maker & Online Diagram Software .
Long to have studied the development of ERDs sooner.	@LE TRUONG THIEN NGUYEN	Nov 23, 2024	1. Establish a continuous learning framework by launching weekly knowledge-sharing sessions. 2. Utilize learned insights to create practical case studies relevant to the team's domain.
Long to have prepared presentation slides for client meetings.	@LE TRUONG THIEN NGUYEN	Nov 23, 2024	1. Ensure professional presentation materials are created before client meetings. 2. Prepare effective slides showcasing key metrics and tailor them to client needs. 3. Develop potential questionnaires for better client explanations.
Amplify fixing syntax in creating table statements and applying functions and algorithms for connected dummy data.	@MINH PHUONG ANH MAI	Nov 23, 2024	1. Organize skill-sharing sessions within the team. 2. Encourage knowledge sharing and best practices.

Long for better instructions in creating tables and dummy data.	@MINH PHUONG ANH MAI	Nov 23, 2024	1. Create comprehensive guides or manuals for code and data operations, including step-by-step instructions, best practices, and troubleshooting tips.
Long for better management of CSV files.	@LE TRUONG THIEN NGUYEN	Nov 23, 2024	1. Set up a versioning system like Git, with clear protocols and guidelines for file naming conventions, updates, and merging changes.
Amplify query statement preparation and interpretation for database efficiency.	@NGUYEN DANG DUY LE	Nov 23, 2024	1. Interview clients and stakeholders for better interpretation of behaviors to create use cases. 2. Read articles and forums like Stack Overflow for industry insights and experience.
Long for meticulous testing processes and data integrity significance.	@NGUYEN DANG DUY LE	Nov 23, 2024	1. Initiate a comprehensive testing plan that includes data integrity checks and query performance testing. 2. Design and execute thorough testing scenarios, recording before-and-after test results.
Need for refined video editing abilities and improved scripting synchronization for presentations.	@MINH DUY NGUYEN	Nov 23, 2024	1. Prepare complete scripts, plot, and shooting plans for better preparation. 2. Collaborate for better visuals and audio quality. 3. Watch tutorials for smoother transitions and impactful editing.

Long for more time for better process and product video outcomes.	@MINH DUY NGUYEN	Nov 23, 2024	1. Optimize work schedules, set priorities, and allocate tasks efficiently. 2. Seek advice on time management from colleagues. 3. Request earlier assignment deadlines from the project leader.
Need for clearer documentation on individual contributions and knowledge-sharing techniques.	@CONG HUNG PHAN	Nov 23, 2024	1. Organize reflection sessions for team members to present their contributions and share insights. 2. Discuss how individual work contributed to the overall project success.