
MINI PROJECT
PRESENTATION

Sustania: Digital Farming Solutions

Project Guide:

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HoD

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RSET

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Problem Statement

Develop a Smart Irrigation System integrated with a Farmer Dashboard

Optimize irrigation using real-time data and machine learning

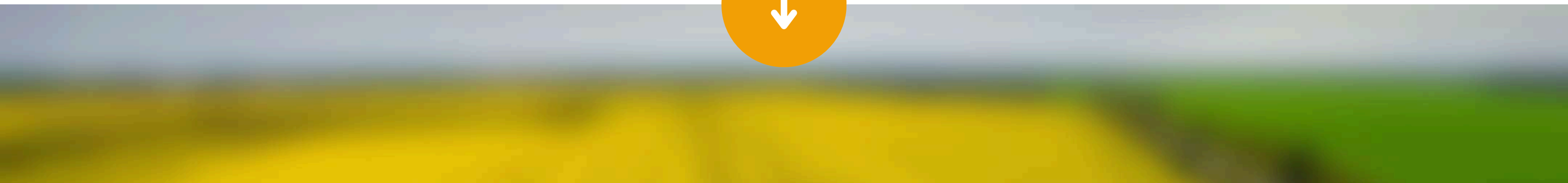
Improve water efficiency and crop yields for small and medium-sized farmers

Project Objectives

- Develop cost-effective smart irrigation system: Creating an affordable solution without compromising on functionality
- Implement ML-based prediction system: Using machine learning to predict optimal irrigation timing and quantity
- Create user-friendly dashboard: Building an intuitive interface that farmers can easily understand and use
- Enable real-time monitoring: Providing instant access to field conditions and system status
- Reduce water waste: Optimizing water usage through precise irrigation control
- Improve crop yields: Enhancing production through optimal water management

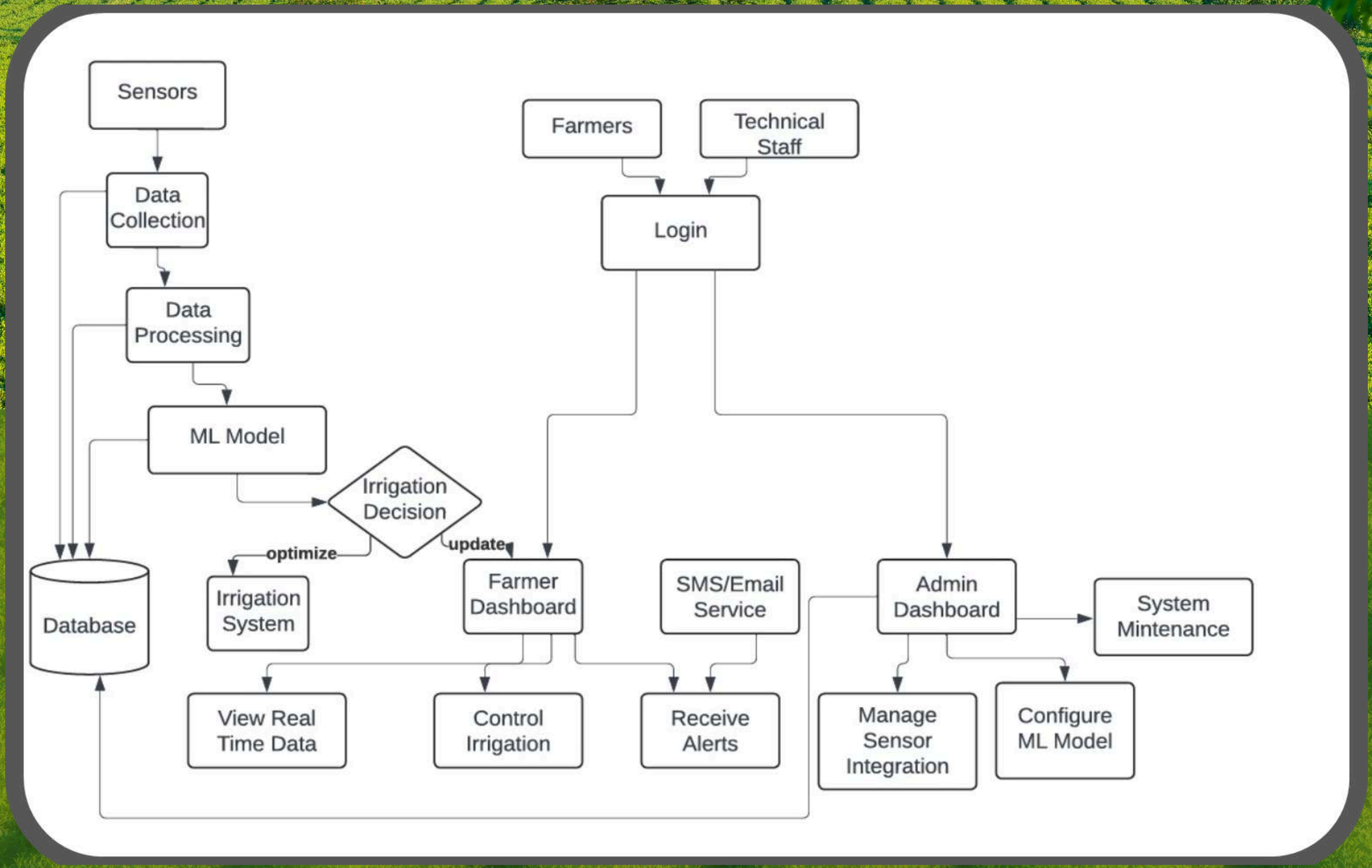
Challenges in Development

- Integration of diverse sensor technologies
- Developing accurate machine learning models for irrigation optimization
- Ensuring user-friendly interface for farmers with varying tech literacy
- Real-time data processing and alert system implementation
- Scalability and adaptability to different crop types and environmental conditions




Fascia
Digital Farming - IoT Solution
Log Out
Farm Details
Farm Name
Kumar Farms & Plantation
Farm ID
MYS-FRM-1
Location
Mysuru
Land Area
4.5 acres
Number of crops grown
3
Previous Crop yield
26 tonnes
Moisture Detector
Motor
Water Required
Water Consumed (Previous day) --- 27910 litres
56 %
FRI
29°
Humidity: 27%
Wind Speed Value: 4.08 m/s
Rain Probability: 0
SAT
39°
SUN
39°
MON
39°
1
Temperature sensor
5
Waterflow sensor
36
Moisture sensor
Farm View
Fire Alarm
Sensor Location Detecting fire
Google
Mangalore
Kannur
Thalassery
Kozhikode
Coimbatore
Crop Yield
44.3%
27.3%
28.4%
Rice
Cotton
Groundnut
Crop Recommendation
Rice
Groundnut
Sugarcane
Millet
Cotton
EXISTING/RELATED WORKS

BLOCK DIAGRAM



MODULES/ PHASES

HARDWARE INTEGRATION

- DHT22 sensor setup and testing
- Soil moisture sensor calibration - Arduino Nano configuration
- Basic sensor reading functionality
- Initial data validation
- API integration
- Real-time data streaming setup

MACHINE LEARNING

- Data preprocessing pipeline
- Feature engineering
- Model development
- Performance validation
- Prediction system
- Error handling
- Real-time integration
- Performance optimization

FRONTEND

- User authentication
- Dashboard layout
- Data visualization
- Weather integration
- Community forum
- Support system
- User profiles
- Advanced analytics dashboard
- Real-time updates
- Final UI polish

BACKEND

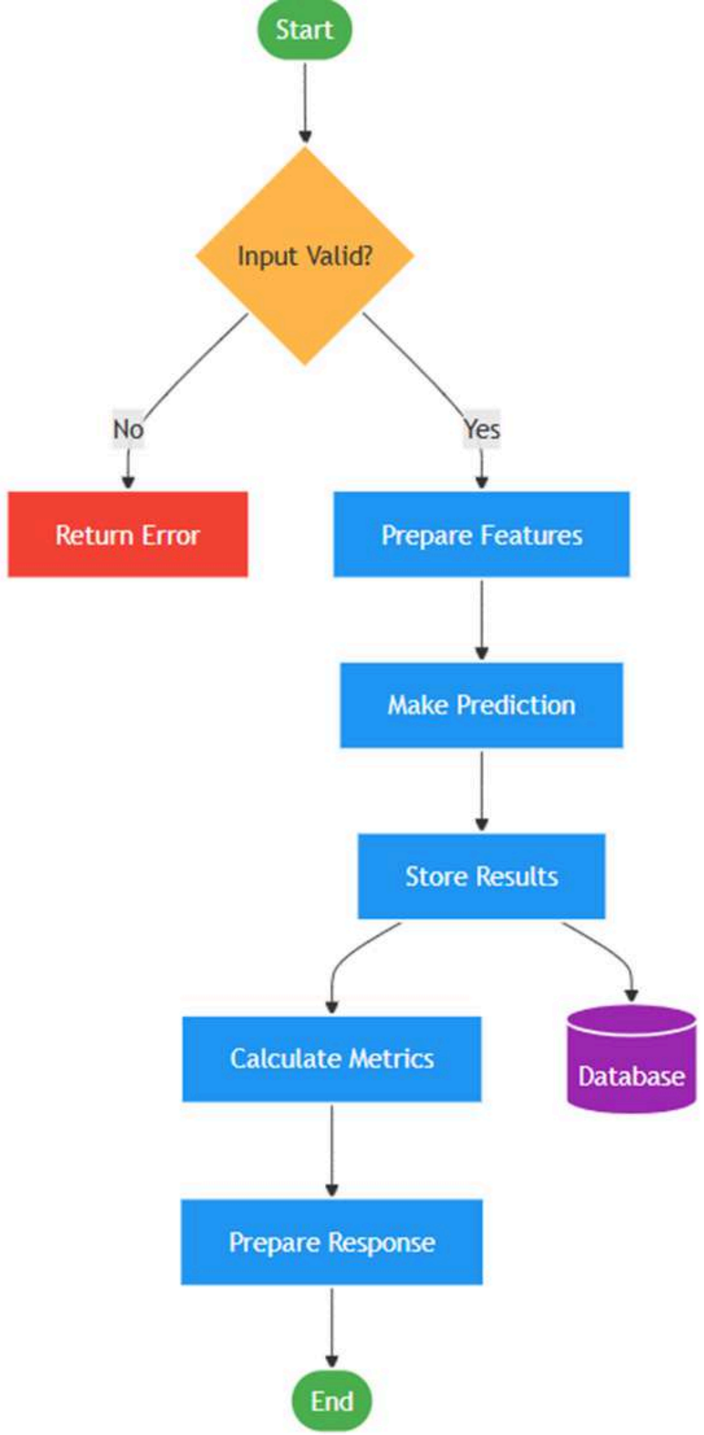
- FAST API development
- Data validation
- Error handling
- Initial testing
- Hardware integration
- Performance optimization
- Final security review

INTEGRATION

- Data flow design
- Basic integration testing
- Error handling
- Full system integration
- Performance testing

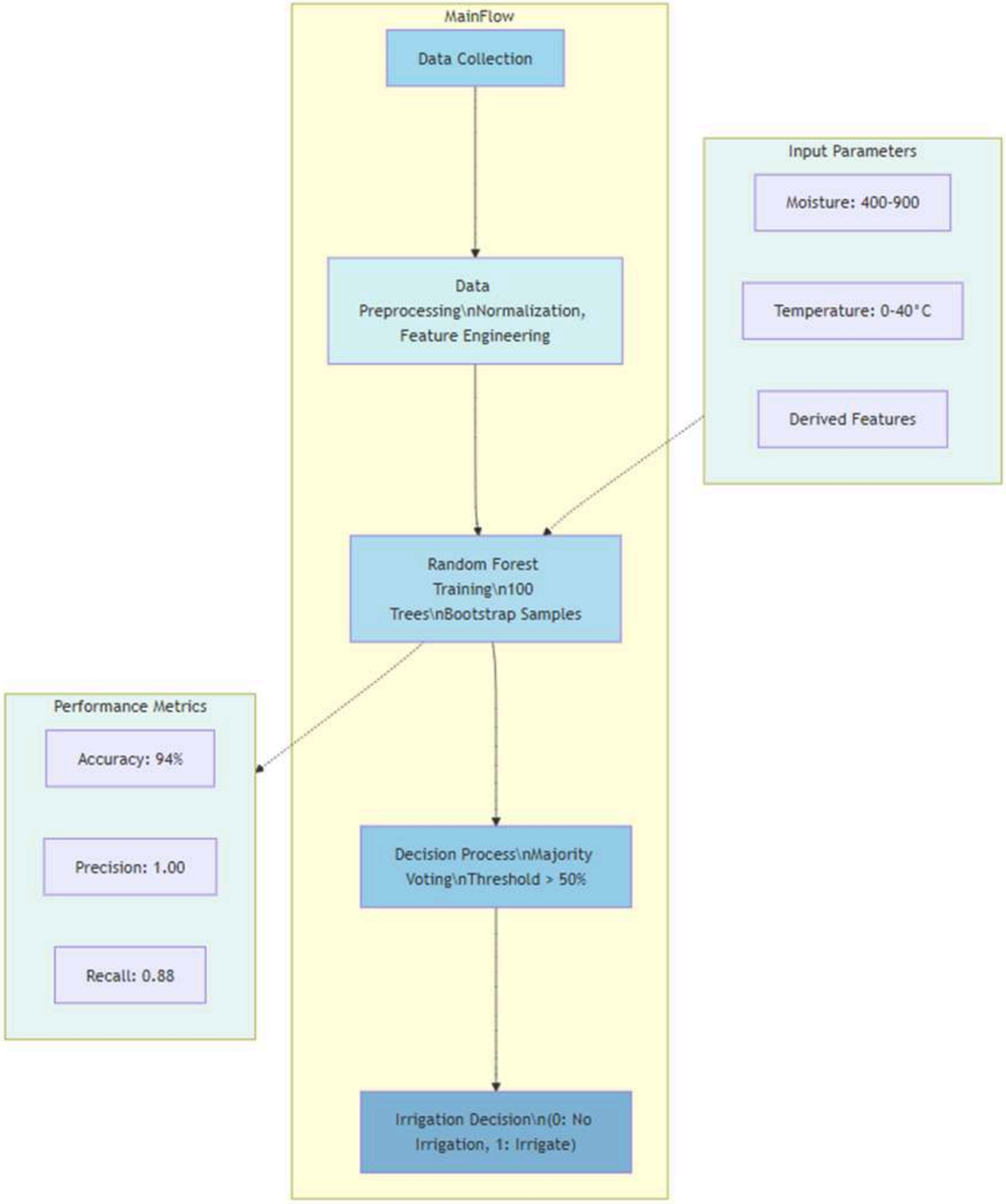
Key Algorithms

ML Model API Flowchart



Key Algorithms

Random Forest



Results and Analysis

Model Performance:

- Achieved 94% overall accuracy in irrigation predictions
- Precision: 1.00 (100% accuracy in positive predictions)
- Recall: 0.88 (88% of actual irrigation needs correctly identified)
- False Positive Rate: 0%
- False Negative Rate: 12.12%

Confusion Matrix

True Negatives **403**	False Positives **30**
False Negatives **61**	True Positives **506**

Model Insights

- Soil moisture is the most important feature (21% importance)
- High model accuracy with AUC-ROC of 0.98
- Strong performance in both irrigation and no-irrigation cases

Recommendations

- Focus on moisture sensor calibration for optimal results
- Consider temperature interactions for better predictions
- Monitor false positives in edge cases

Results and Analysis

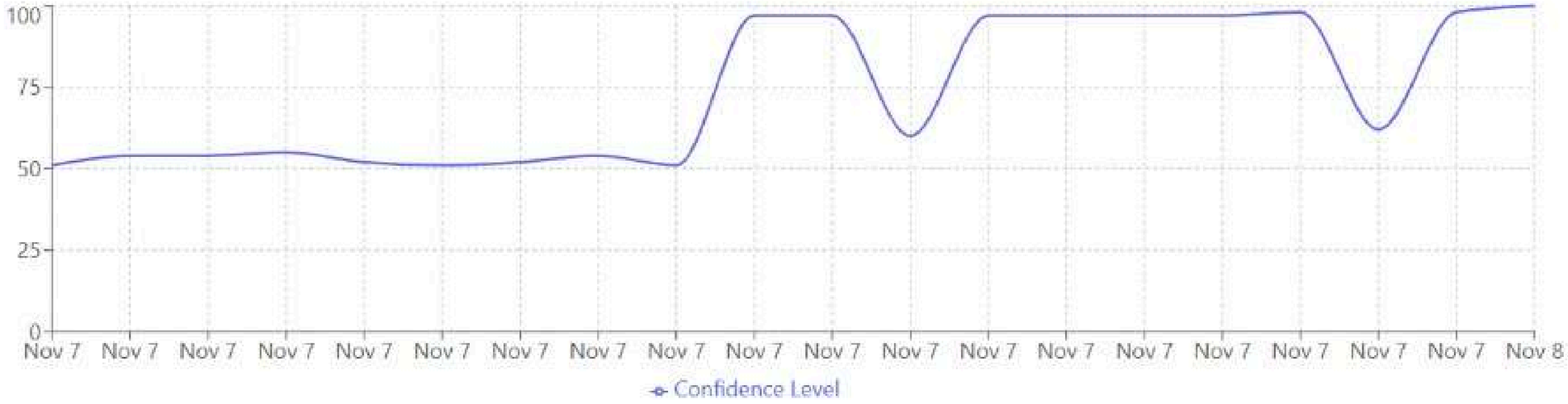
Technical Implementation:

- Successfully integrated IoT sensors with real-time data processing
- Implemented comprehensive dashboard with dark mode support
- Created robust ML pipeline with feature engineering and model optimization
- Developed scalable architecture supporting future expansions

Sustania

- Dashboard
- Irrigation
- Weather
- Analytics
- Forum
- Support
- Profile

ML Model Predictions



TIME	RECOMMENDATION	CONFIDENCE
Nov 8, 2024, 12:11 AM	Skip	100%
Nov 7, 2024, 9:37 PM	Skip	98%
Nov 7, 2024, 9:37 PM	Skip	62%
Nov 7, 2024, 7:43 PM	Skip	98%
Nov 7, 2024, 7:43 PM	Skip	97%

Recent Performance

Average Confidence: 73.6%

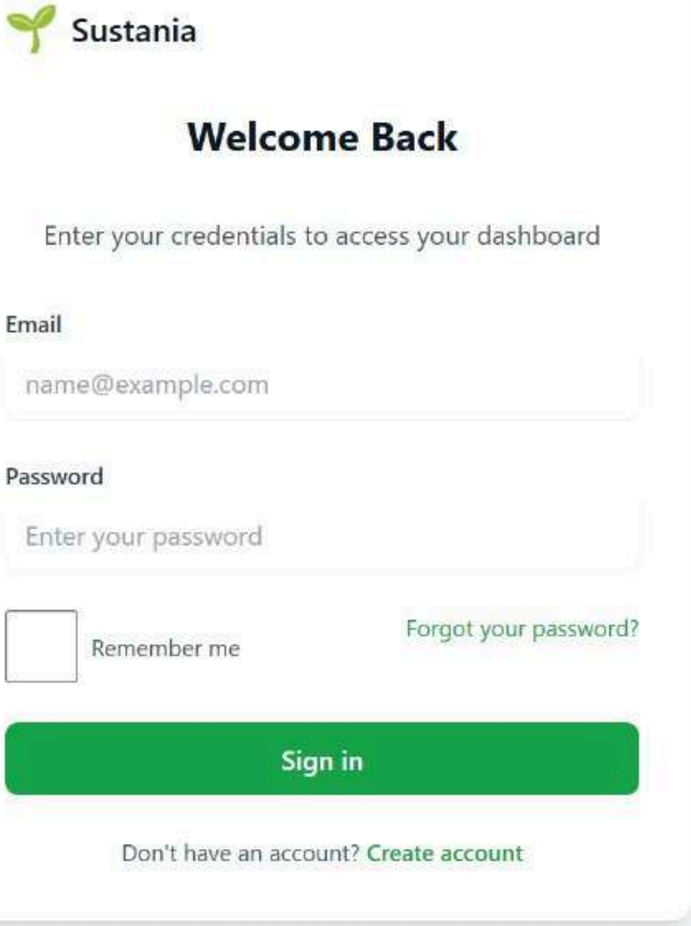
CONCLUSION

- **Achievements:**
  - Successfully implemented ML-based irrigation system: Functional intelligent irrigation control
  - Achieved high prediction accuracy: Reliable automated decision making
  - Created user-friendly interface: Accessible system control for all users
  - Enabled real-time monitoring: Immediate access to field conditions

- **Impact:**
  - Improved water usage efficiency: Significant reduction in water waste
  - Enhanced crop yield potential: Better growth conditions through optimal irrigation
  - Cost-effective solution: Affordable implementation for small farmers
  - Accessible to small farmers: User-friendly design for varied technical expertise

SCREENSHOTS

UI Design


Sustania
Welcome Back
Enter your credentials to access your dashboard
Email
name@example.com
Password
Enter your password
Remember me
Forgot your password?
Sign in
Don't have an account? Create account

Sustania

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AU

- Dashboard
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Dashboard

Sensor Data

Soil Moisture

748

Valid range: 400-900

Temperature

16.4°C

Valid range: 0-40°C

Last updated: Nov 8, 2024, 12:12 AM

ML Prediction

Get Prediction

No Irrigation Needed

Current soil moisture levels are adequate.

Confidence 100%

Last prediction: Nov 8, 2024, 12:11 AM

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Community Forum

New Post

Search posts...

All Posts | Crop Management | Tech Support | Market Prices | Best Practices

JS

Tips for optimizing irrigation schedules

Posted by John Smith • 10 months ago

I have been experimenting with different irrigation schedules...

24 12 234 irrigation optimization

SJ

Current market prices for organic wheat

Posted by Sarah Johnson • 2 days ago

Looking for information about current market trends...

15 8 156 market wheat

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Profile Settings

Full Name

John Doe

Email

john@example.com

Phone

+1 234 567 8900

Organization

Sustania Farms

Save Changes

Account Status

Member Since: Jan 2023

Plan: Professional

Next Billing: Jan 1, 2024

localhost:5173/profile

Testing

```
(irrigation_env) D:\GitHub\Sustania-Dev\src\model\irrigation_project>python test_service.py
Testing Wheat Irrigation Prediction Service...
------------------------------------------------

1. Testing health endpoint...
✓ Health check successful
Response: {'status': 'healthy', 'timestamp': '2024-11-15T13:43:02.722026'}

2. Testing model info endpoint...
✓ Model info retrieved successfully
Response: {'model_type': 'Random Forest Classifier', 'features_required': ['moisture', 'temperature'], 'version': '1.0'}

3. Testing prediction endpoint...
Sending test data: {
  "moisture": 645.1134129652032,
  "temperature": 37.0018915407309 45
}
✓ Prediction successful
Need irrigation: False
```

THANKYOU