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कल्याण मंत्रालय  
MINISTRY OF  
AGRICULTURE AND  
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# AGRISURE GREENATHON

## Team Details

- Team Name: The Alchemist
- Team Leader Name: Devesh
- Problem Statement: Smart Agriculture on a Budget

## Brief about the idea

- We are developing an advanced Soil and Agriculture Monitoring System that leverages Near Field Communication (NFC), artificial intelligence (AI), and sensor fusion, all while maintaining a low budget.
- Our system utilizes a network of monitoring devices equipped with NFC technology, which reduces the cost by 50% compared to high-end Wi-Fi modules.
- These devices are placed throughout the field, are outfitted with various sensors to capture real-time data on soil moisture, pH levels, electrical impedance, salinity, nutrient levels, and fertilizer properties.
- By employing sensor fusion and AI methods, we are also predicting readings of expensive sensors, further reducing overall costs.
- The system provides timely, customized alerts to farmers via WhatsApp. These alerts are tailored based on the specific crops sown in the field, **offering insights into missing nutrients, irrigation needs, and areas requiring fertilization.**

## How we are creating our solution

There are 2 major components of our prototype which acts as backbone of this system

Using **AI and Soil Simulation** to get soil health

- We use the readings of these sensors data Electrical Conductivity Sensors, pH Sensors, Humidity Sensors, Soil Moisture Sensors, Temperature Sensors in real time along with the historical data and spectral data available.
- By applying empirical pattern detection and soil simulation through open-source APIs in the cloud, we can calculate nutrient dynamics and other soil characteristics without relying on expensive sensors. While our solution doesn't provide 100% accuracy, it achieved 75%-80% accuracy during a dry run.

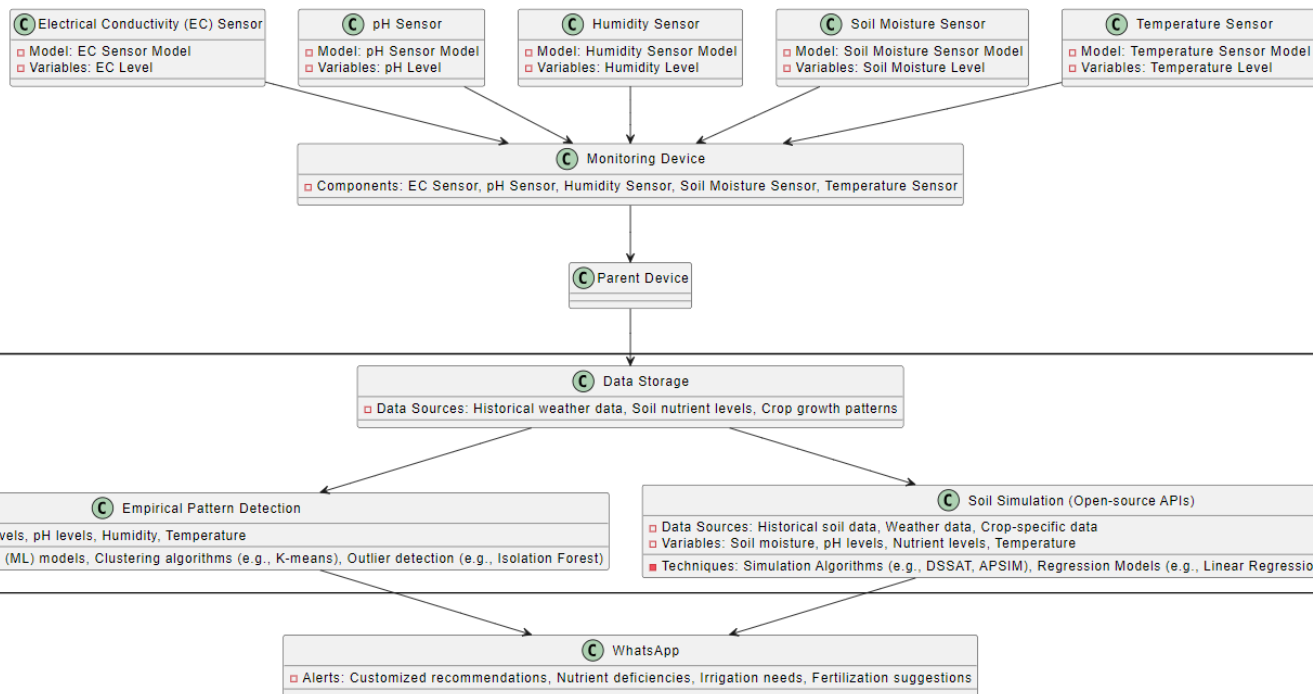
Using NFC tags to create a network of real time data across field

- Our monitoring device is equipped with NFC tech, which allow sensors to send data to parent device in real-time which in turn sends data to cloud for processing.
- In this way we reduce our whole Network setup in a huge field very effectively.

## List of features offered by the solution

- Our main USP is that while maintaining Cost effectiveness , the solution is delivering results with a very good accuracy. Readily available devices in market are very expensive.
- As monitoring devices are spread across the field, farmer gets to know which particular part of land needs irrigation. Notification about spread of fertilizers at specific areas will be given to farmer, which in turn will help in resource utilization.
- Real-time updates about the soil health will make the yield production much higher as the Nutrients update will be given to farmer so based on crops sown he can put that nutrient to a particular area.
- Whole network can be customised to major crops grown , thus making the solution season friendly.

## Process flow diagram



## Technologies to be used in the solution(for prototype)

### Cloud Processing (AWS Services at all stages of deployment):

#### •Data Storage:

- **AWS RDS**

#### •Empirical Pattern Detection:

- **AWS SageMaker:** Managed machine learning service for training and deploying ML models.
- **AWS Lambda:** For connecting with Twilio to send whatsapp alerts.

#### •Soil Simulation:

- **AWS Batch:** Runs batch computing workloads for large-scale simulations.

### Twilio

- For sending whatsapp alerts via bot.

## Prototype Performance report/benchmarking

- For prototype testing, we created a small farm network consisting of 8 devices connected to a central parent device, where potato seeds were sown in different pot segments.
- We collected real-time data from the field and set up an alert system using LED lights to indicate any nutrient deficiencies.
- During this test, we deliberately avoided adding water or manure/urea to the pots, which led to deficiencies in nitrogen and phosphorus.
- The simulation models effectively detected these deficiencies, with the nitrogen prediction model achieving an accuracy of 78%.
- Despite initial skepticism about the nitrogen predictions, the results confirmed the model's reliability.

**Full demo in Video**

## Additional Details/Future Developments

As of submitting prototype, we are done setting both sensor fusion and communication network. Real time simulations are running on the basis of real time data.

We are yet to integrate it with whatsapp messages , which will be presented on the final day.

### **What to expect form us in final round:**

- We are planning to test it live on full field before final round.
- Whatsapp implementation.
- Good finished prototype design to be used.
- Balance business perspective of solution. Full Cost breakup of device(right now we need to estimate it over full land, due to time constraints we gave priority to prototype building )



## GitHub Public Repository Link & Demo Video Link

Github Link – <https://github.com/Devesh929/Monitoring-Health-Agri>

Youtube Video demo link - <https://youtu.be/TquR9przkyE>



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