# CropMedic 2.0

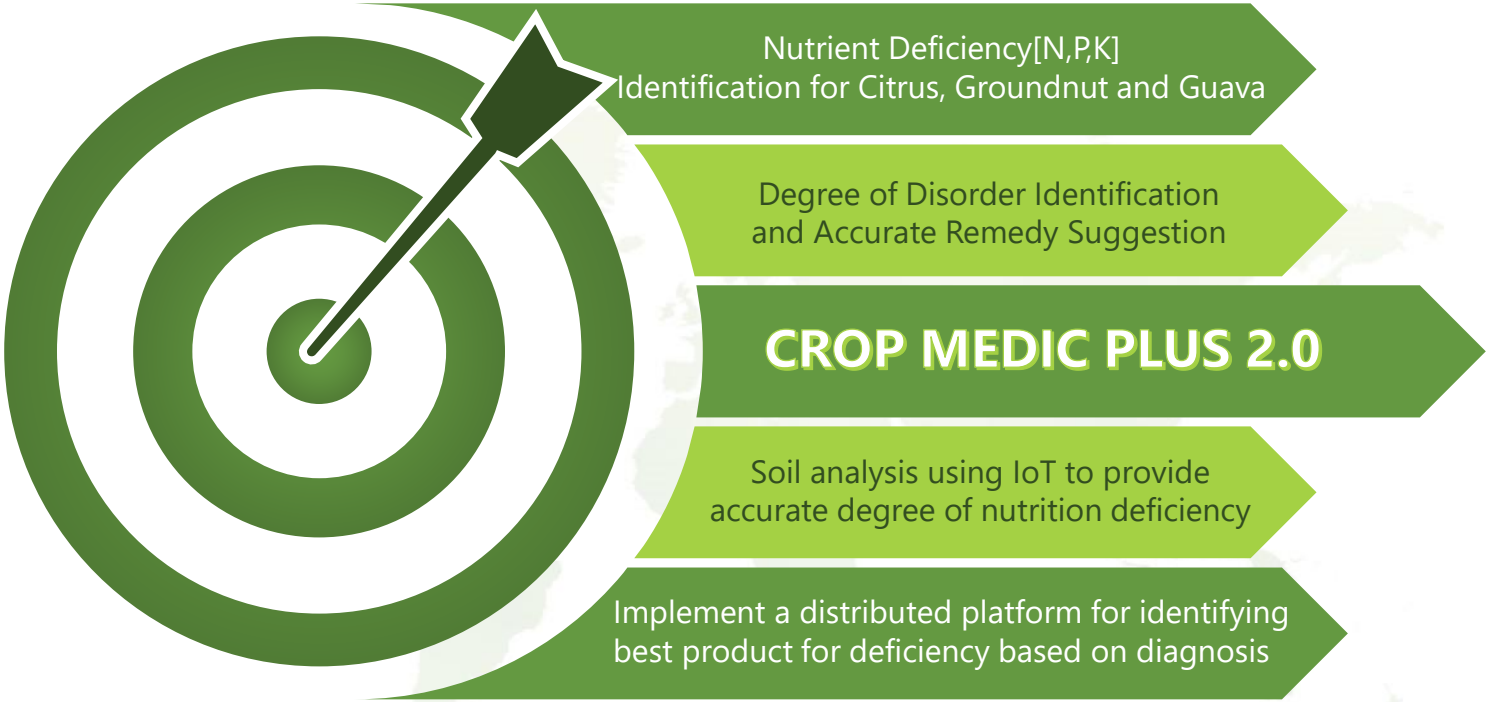
## A SMART PLANT DISORDER IDENTIFICATION SYSTEM

SLIIT
FACULTY OF COMPUTING

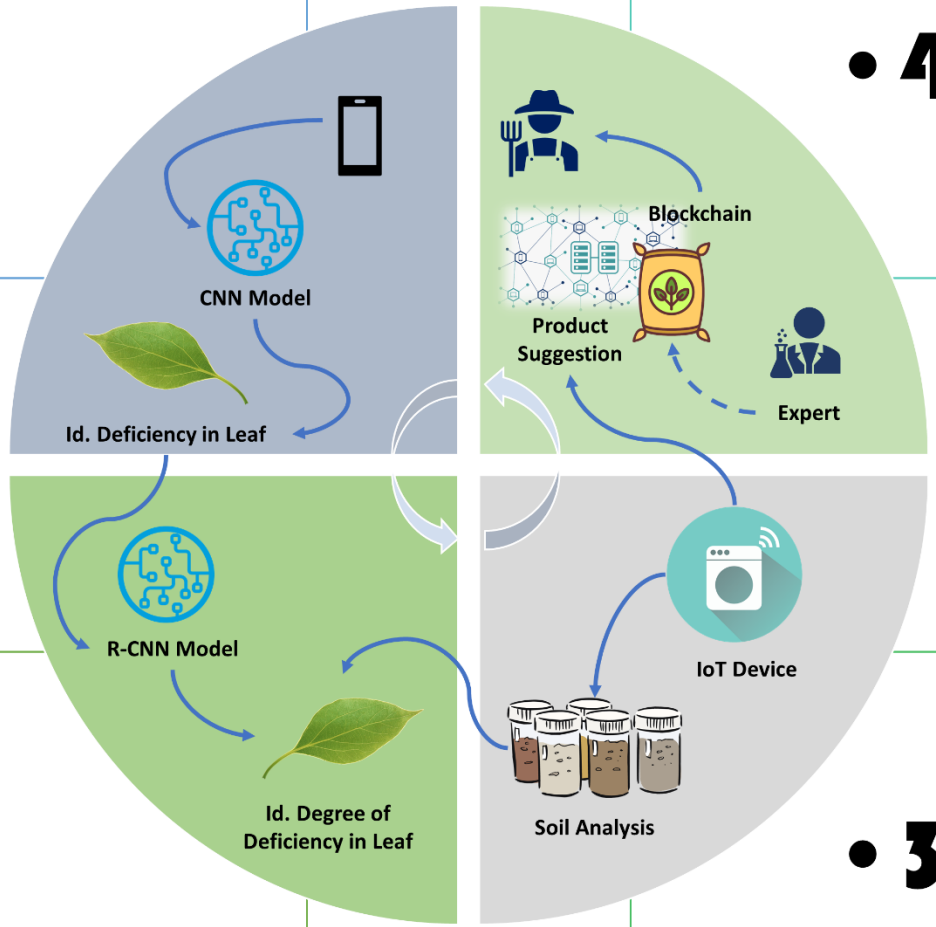
# Research Problem

1. **39.4%** — Agriculture's contribution to global GDP [1]
2. **43%** — Agriculture's contribution to global export market [1]
3. **42%** — Agriculture production loss due to plant diseases [2]
4. ☑ — Leading cause of plant diseases is nutrition deficiency [3]
5. 🏆 — Feasible smart solution for early detection of nutrition deficiencies recommending accurate chemical remedies

# Overall Objectives



# System Overview Diagram



# COMPONENT 01: IDENTIFICATION OF NUTRIENT DISORDER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# RESEARCH GAP

Mostly, Researchers have done the research for the identification of diseases in plant leaf.

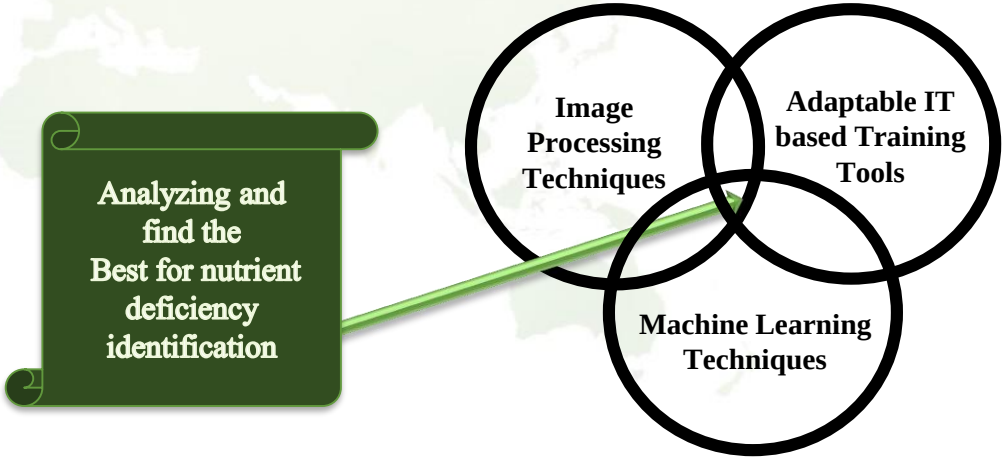
Nutrition disorder identification studies mostly contain satellite image usage of entire plots or expensive chlorophyll meters [1].

Impractical for Field Usage and Expensive [2]

- A mobile phone application that captures an image of the plant leaf and identifies the nutrient disorder
- Use of Machine learning and deep learning techniques for the nutrient disorder identification

# RESEARCH QUESTIONS ?

**01** How to identify the crop and nutrient deficiencies using image processing techniques and machine learning?



# OBJECTIVES

**Main Objective**

Identify the Nutrient deficiency in Plants (Groundnut, Guava, Citrus)

**01**

Data Collection

**02**

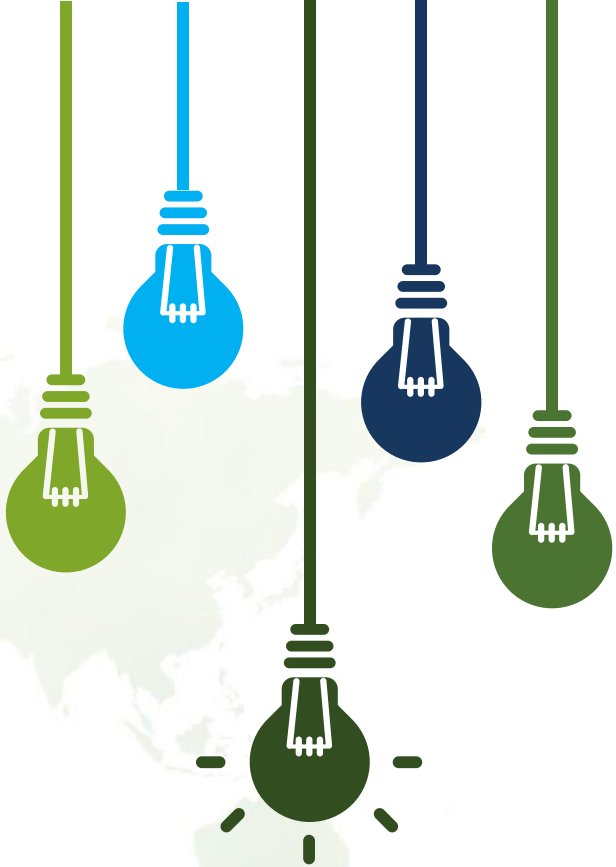
Image Preprocessing

**03**

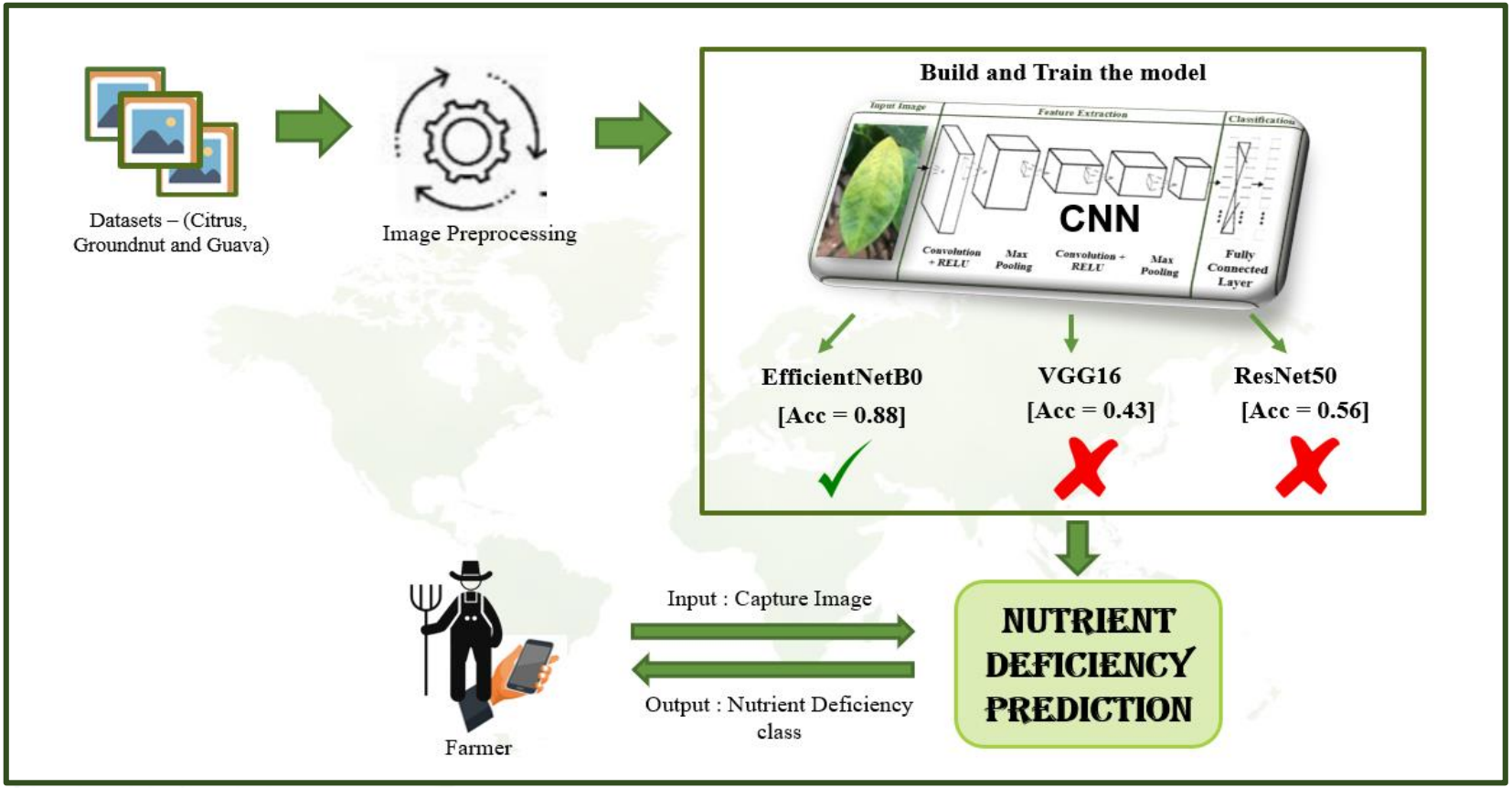
Build the Machine Learning model for Training

**04**

Prediction of Nutrient Disorder through the mobile app



# METHODOLOGY - SYSTEM DIAGRAM



# ACHIEVEMENT

| EfficientNetB0 | VGG16 | ResNet50 |
|---|---|---|
| 0.8837 | 0.4384 | 0.5684 |

**3 Models were trained – Select the Best for the disorder identification**

```
model = load_model("/content/drive/My Drive/deficiency classification/efficientnet.h5")

from sklearn.metrics import accuracy_score
print ('accuracy', end = ' = ')
print (accuracy_score(image_pred.classes, Y_predicted_class_indices))
```

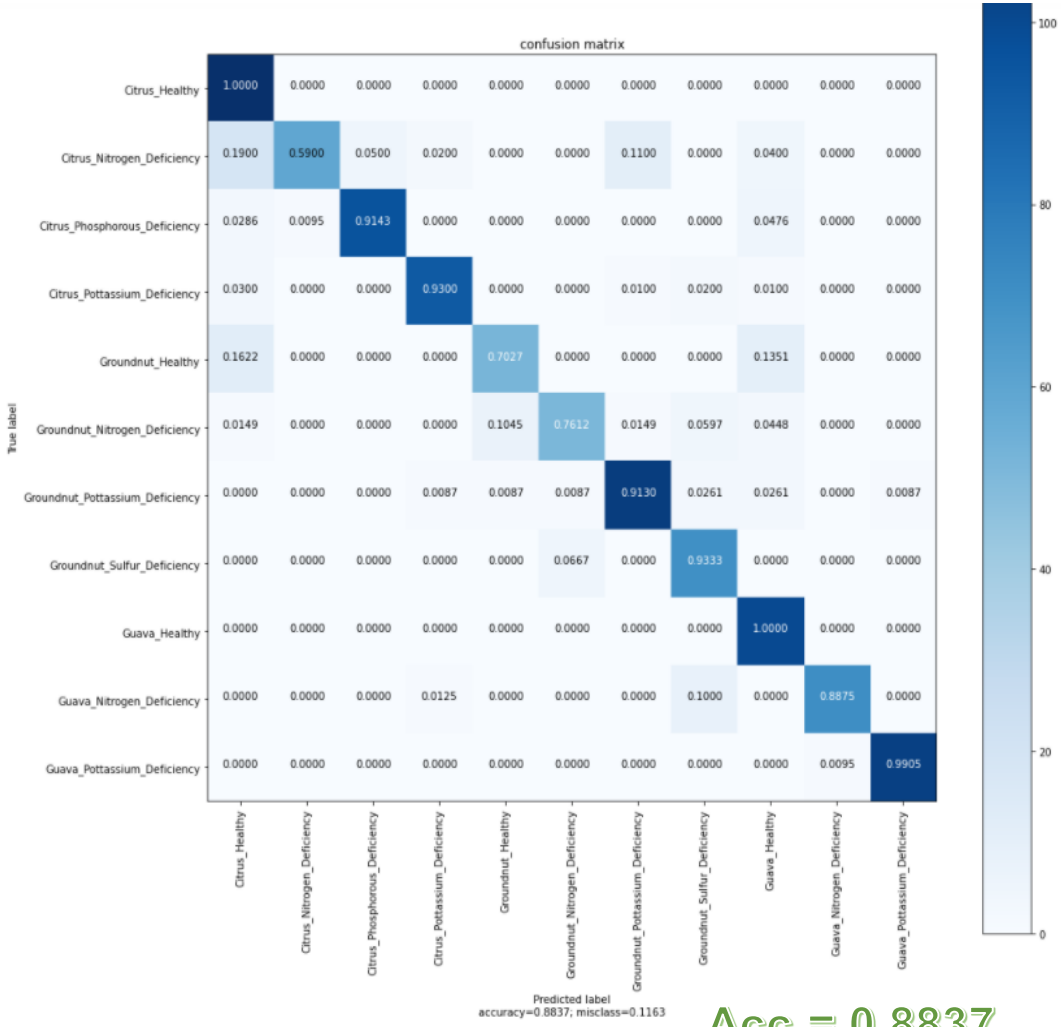
```
accuracy = 0.8837209302325582
```

```
model = load_model("/content/drive/My Drive/deficiency classification/resnet50.h5")

print ('accuracy', end = ' = ')
print (accuracy_score(image_pred.classes, Y_predicted_class_indices))
```

```
accuracy = 0.5616438356164384
```

```
model = load_model("/content/drive/My Drive/deficiency classification/vgg16.h5")

print ('accuracy', end = ' = ')
print (accuracy_score(image_pred.classes, Y_predicted_class_indices))
```

```
accuracy = 0.4383561643835616
```



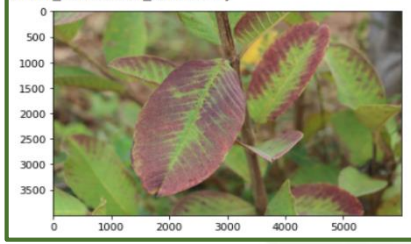

**Acc = 0.8837**

# ACHIEVEMENT

**- Results From Backend Model**

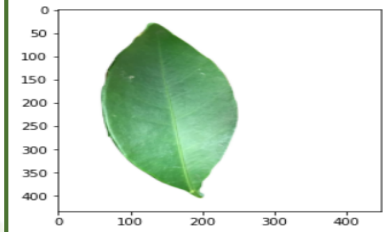
```
output = model.predict_classes([prepare('/content/drive/My Drive/Datasets/testingData/Guav
disorder=image.load_img('/content/drive/My Drive/Datasets/testingData/Guava_Pottassium_De
plt.imshow(disorder)
print(Classes[int(output)])
```

```
Guava_Pottassium_Deficiency
```



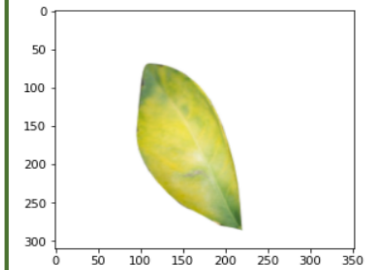
```
output = model.predict_classes([prepare('/content/drive/My Drive/Datase
disorder=image.load_img('/content/drive/My Drive/Datasets/testingData/C
plt.imshow(disorder)
print(Classes[int(output)])
```

```
Citrus_Healthy
```



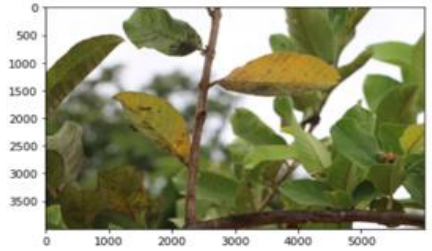
```
output = model.predict_classes([prepare('/content/drive/My Drive/Datasets/test
disorder=image.load_img('/content/drive/My Drive/Datasets/testingData/Citrus_N
plt.imshow(disorder)
print(Classes[int(output)])
```

```
Citrus_Nitrogen_Deficiency
```



```
output = model.predict_classes([prepare('/content/drive/My Drive/Datasets/testingData/
disorder=image.load_img('/content/drive/My Drive/Datasets/testingData/Guava_Nitrogen_D
plt.imshow(disorder)
print(Classes[int(output)])
```

```
Guava_Nitrogen_Deficiency
```



# FINAL PREDICTION IN MOBILE APP

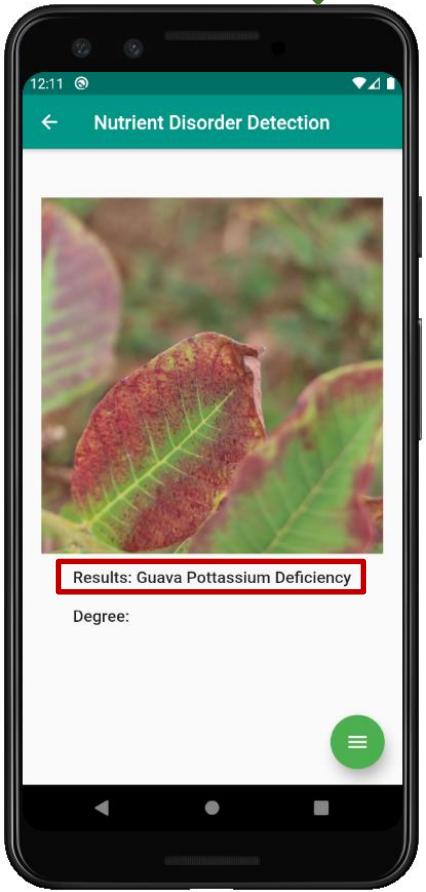
```
D/eglCodecCommon(18056): setVertexArrayObject: set vao to 0 (0) 62 0
I/flutter (18056): [{confidence: 0.9994564652442932, index: 10, label: Guava Pottassium Deficiency}]
I/flutter (18056): OPENING DIAL
```

01


02


03


04



# REFERENCE

[1] J. G. A. Barbedo, “Detection of nutrition deficiencies in plants using proximal images and machine learning: A review, ” *Computers and Electronics in Agriculture*, 02-May-2019. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0168169918318957. [Accessed: 15-Jan-2020].

[2] N.Minni, N.Rehna “Detection of nutrient deficiency in plants using image procssing techniques”, Department of Computer Science ,College of women Karaikkal, Puducherry, India Dong-A University, ISSN 2278-2397

[3] Sumit Saha, “A Comprehensive guide to Convolutional Neural Networks- the ELI5 way,” December 15, 2018. [Online]. Available: https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53 [Accessed Jan 04, 2020].

# DEMONSTRATION

# DISORDER DEGREE IDENTIFICATION

IT17109840 – L.H.RAJARATNE

Specialized in Cyber Security

# RESEARCH GAP

- Identify the extent of nutrition deficiency in a plant by using computer vision techniques

- Using Mask RCNN to Identify the colour changes in leaves necessary to identify the deficiency

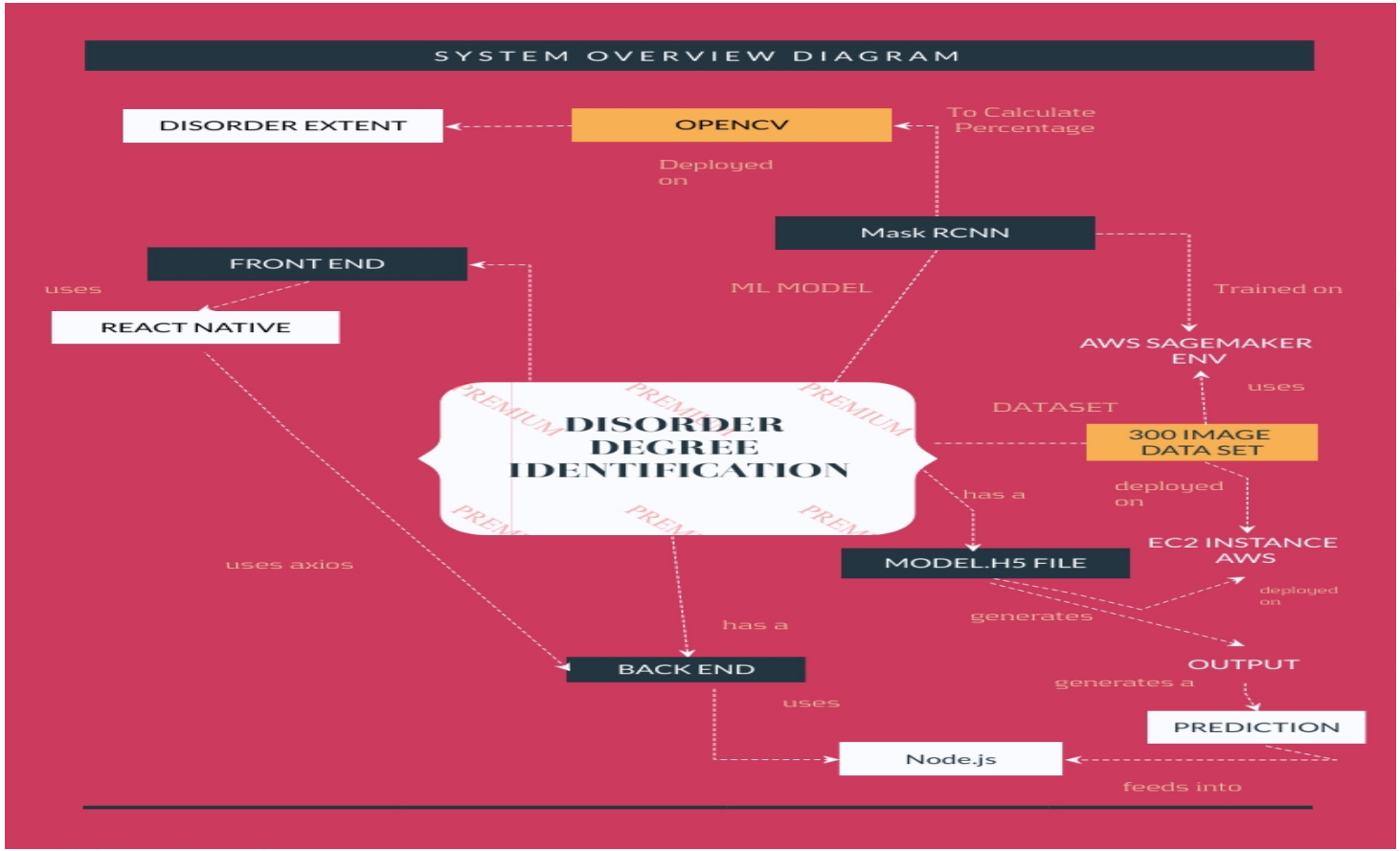
# RESEARCH QUESTIONS

- How is a nutrition deficiency measured in the field?
- How can computer vision techniques be used to measure the spread of a symptom?
- How to calculate the disorder degree using Mask RCNN?

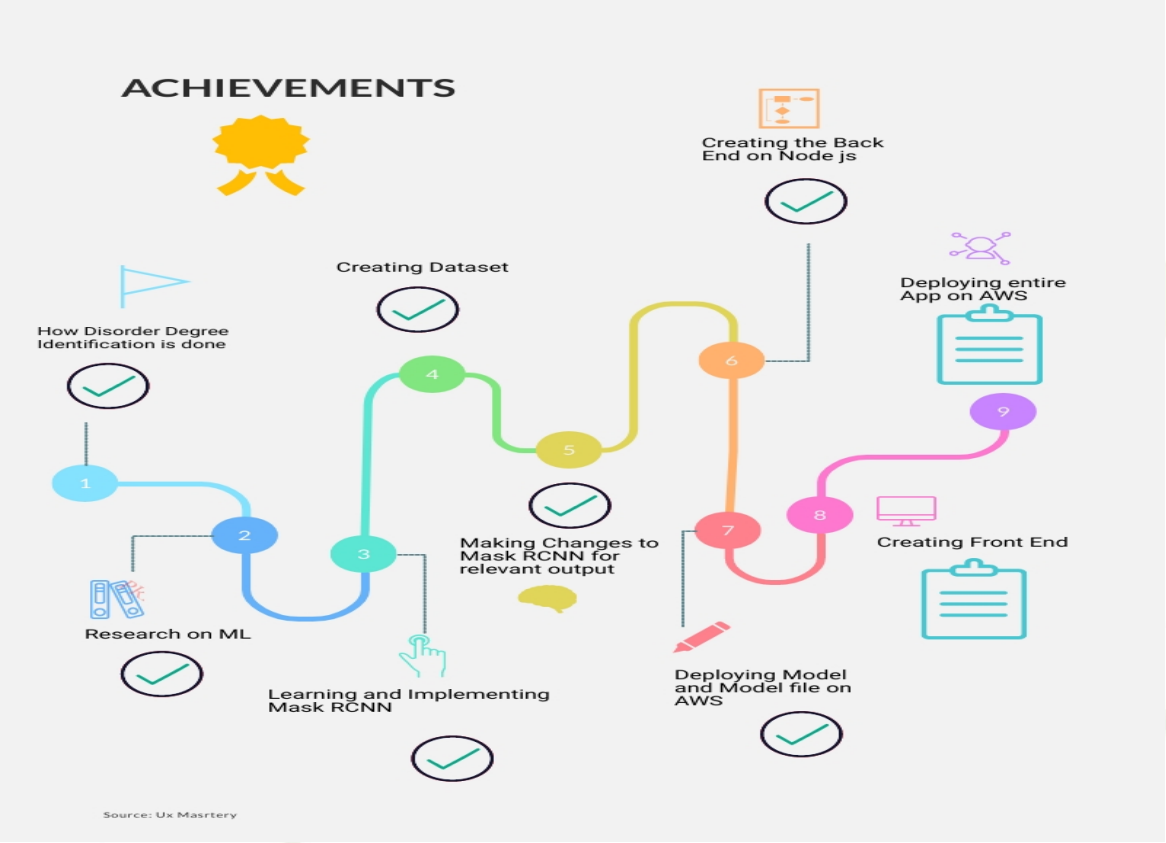
# OBJECTIVES

- Study the disorder degrees and its quantification
- Identify the most suitable computer vision technology to use in identifying the extent of a nutrition disorder
- Using mask rcnn to quantify the disorder degree

# METHODOLOGY - SYSTEM DIAGRAM

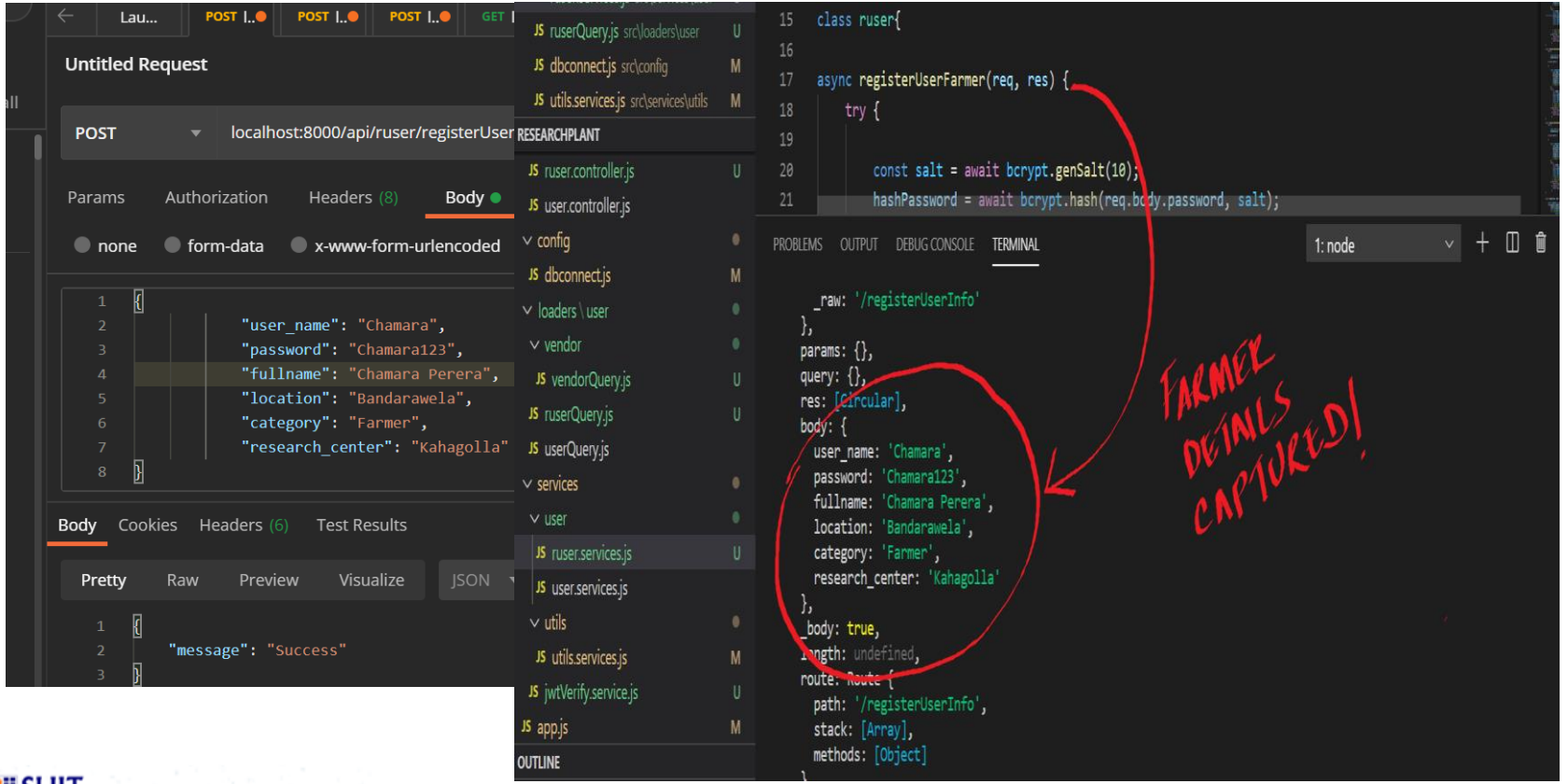


# ACHIEVEMENT



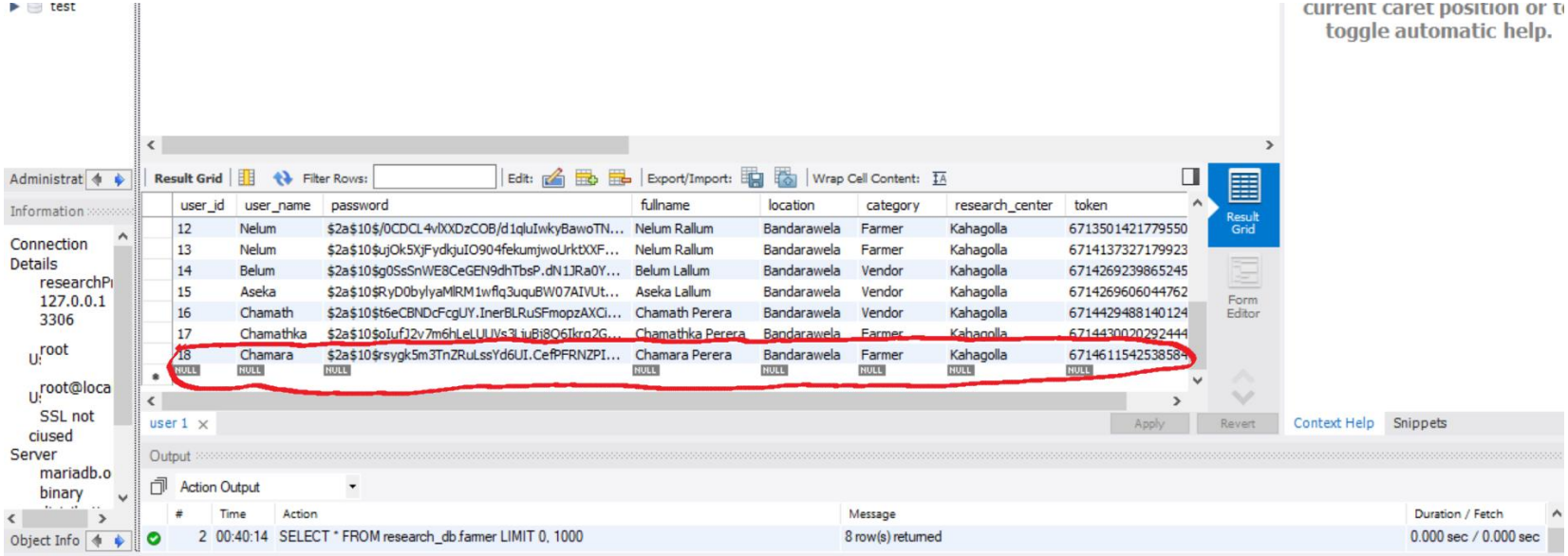
# EVIDENCE

## SIGNUP - CHAMARA



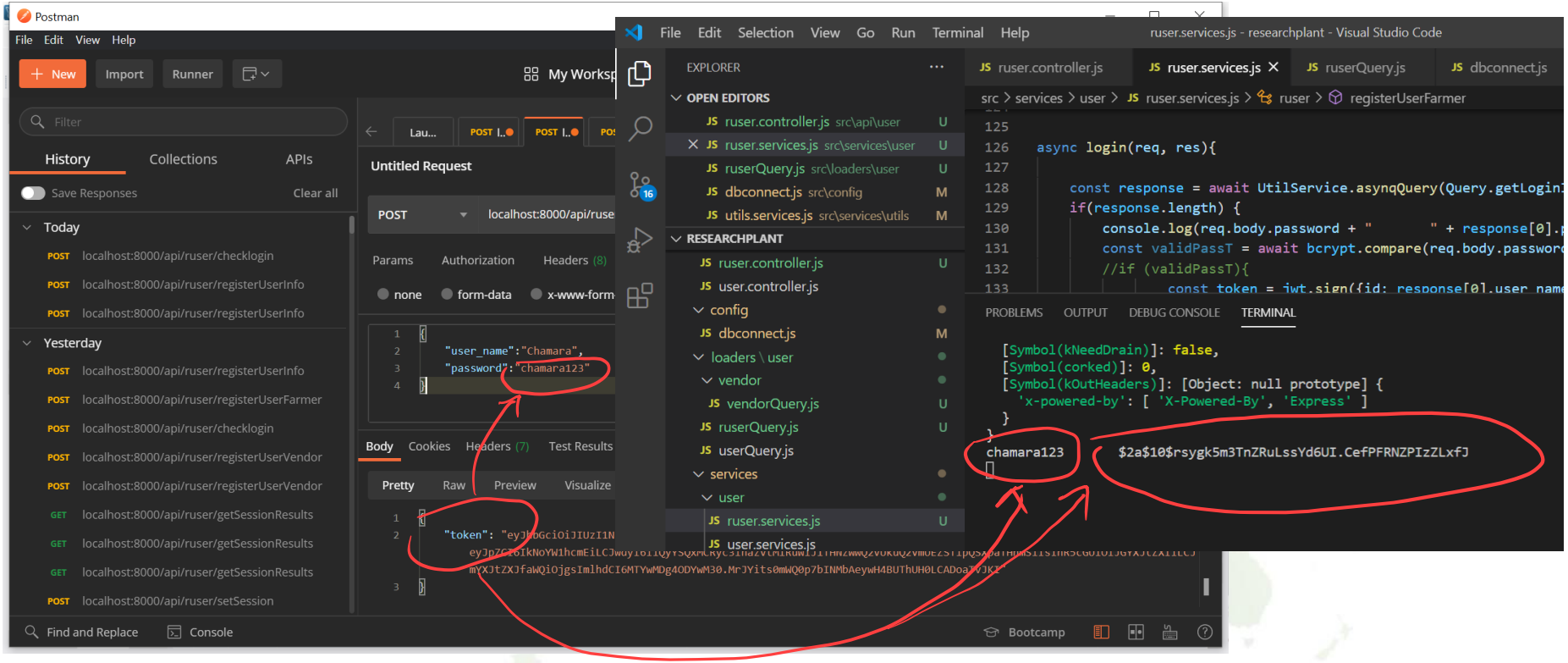
# EVIDENCE

## SIGNUP - CHAMARA



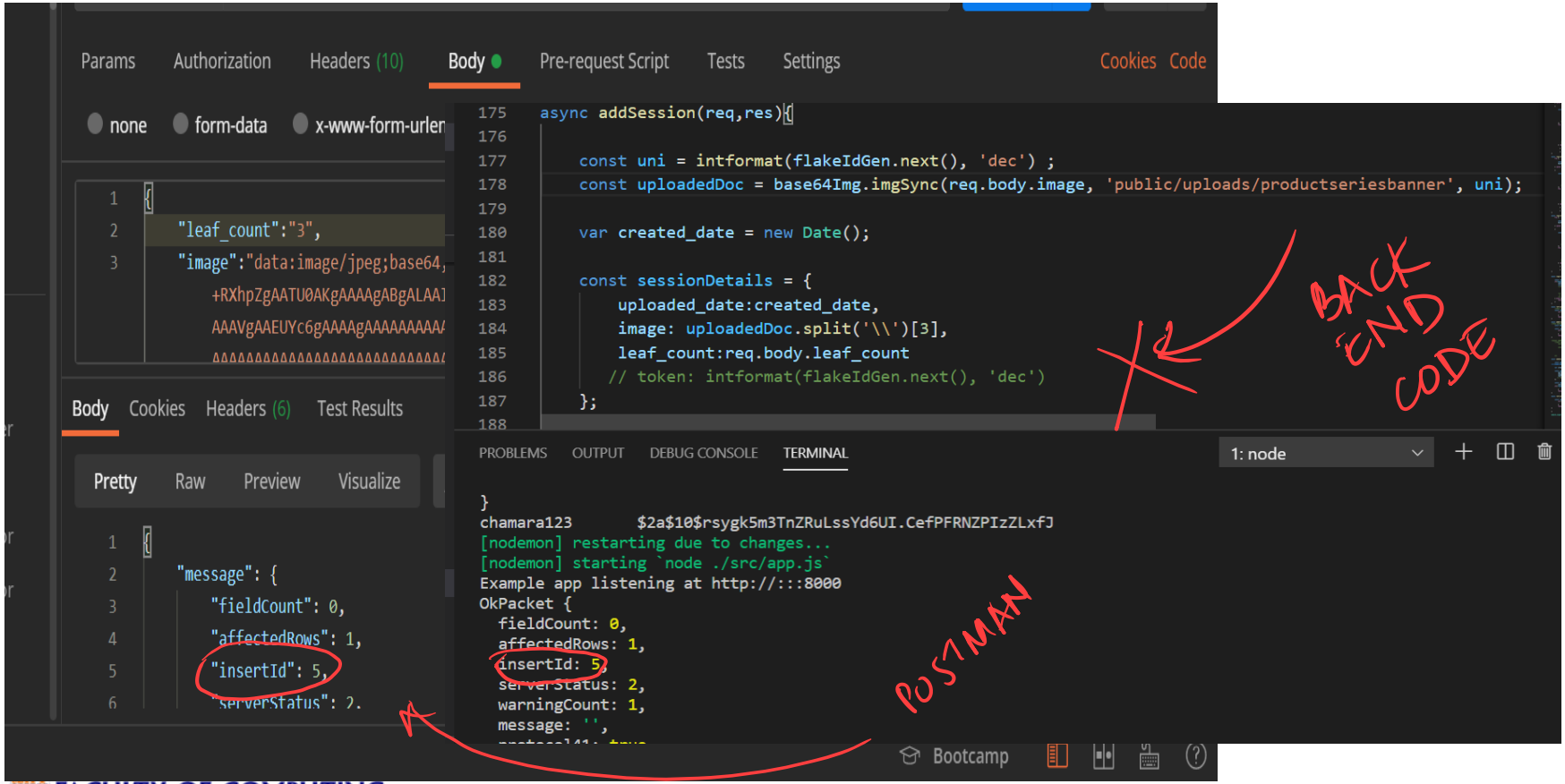
# LOGIN - CHAMARA

EVIDENCE



# ADDING SESSION

EVIDENCE



Component 02: **Develop an IOT device to measure NPK level of soil**

# IT15070418- K.T.RAMASINGHE

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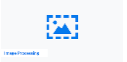
# RESEARCH GAP

Almost all the projects were carried out by doing laboratory tests with using various chemicals or using expensive sensors to check the nutrient levels in the soil.

Sensors to test the nutrient factors of the soil will lead to spend the user a lot of money



using image processing techniques and data mining techniques, need specific people who has specialized in the area of image processing or the chemists who needs to perform the lab tests according to the soil samples

Farmers satisfactions

# RESEARCH QUESTIONS

Farmers have lack of knowledge about soil nutrient levels.

Farmers need to test soil samples with the help of agriculture department.

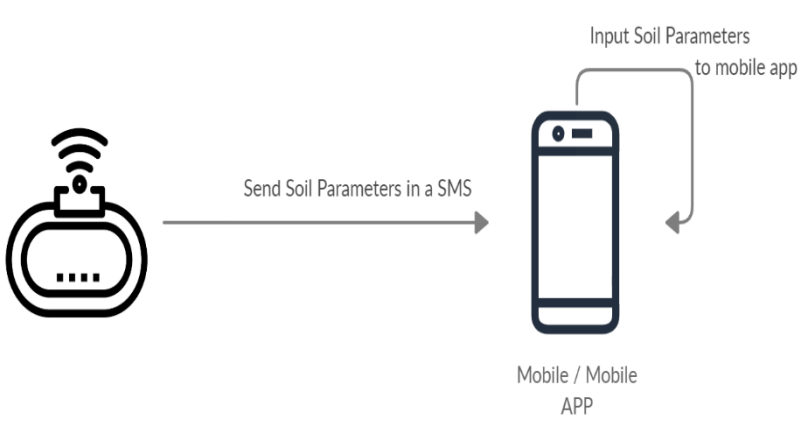
Variety of soil nutrient levels in same land.

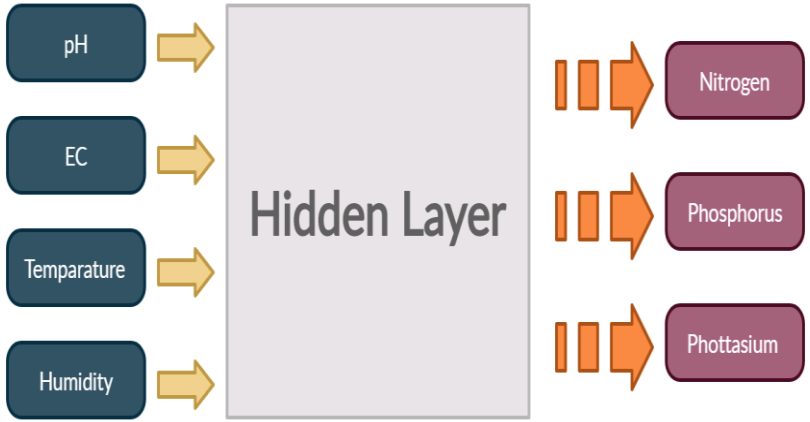
Farmers use same soil test report for 1.5 years.

Maintaining cost of industrial machines is expensive.

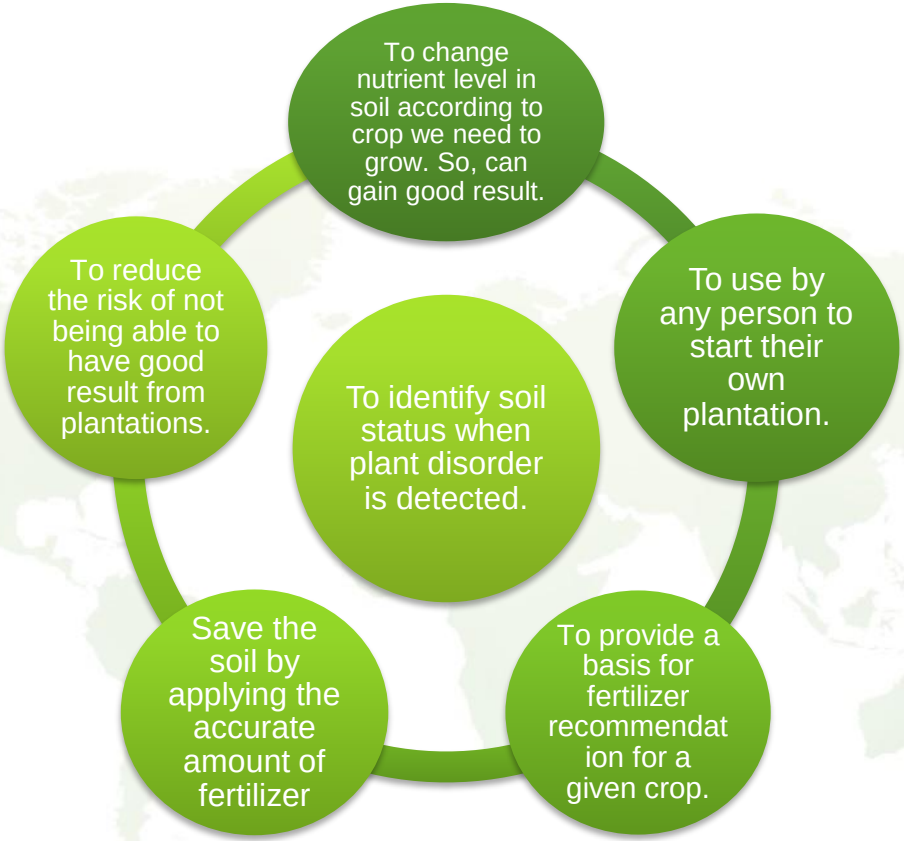
The fear of new cultivators to entering the industry

# METHODOLOGY - SYSTEM DIAGRAM



# OBJECTIVES


To change nutrient level in soil according to crop we need to grow. So, can gain good result.
To use by any person to start their own plantation.
To provide a basis for fertilizer recommendation for a given crop.
Save the soil by applying the accurate amount of fertilizer
To reduce the risk of not being able to have good result from plantations.
To identify soil status when plant disorder is detected.

# ACHIEVEMENT

01

- Constructing user friendly consumer device to measure NPK level of soil.

02

- Being a motivational fact for farmers to do more Cultivations.

03

- Proposing and constructing a successful system To protect soil contamination.

# Demonstration

# Component 04: **Decentralized System for Fertilizer Procurement**

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# RESEARCH GAP

Sri Lankan authorities have backed an approach toward e-agriculture, utilizing 'Smart Farming' for sustainable practices. Practical infeasibilities of this approach are abundant

Most Systems constructed for information management are centralized which enhances risk, and are trust driven, relying on the Human Trust Factor for verification

While the environmental effects of Fertilizer Mismanagement are widely discussed, the social sensitivity of this matter is given less prominence. The social sensitivity arguably has the greatest impact on fertilizer procurement.

# RESEARCH QUESTIONS

**01**

- How feasible would a solution integrating farmers, field experts and vendors be?
- What are the factors to be considered when constructing a system interlinking stakeholders?

**02**

- How is it possible for proposed system to lift asymmetry of information?
- What information should be provided by expert in-order-to help farmer make well-informed decision?

**03**

- How can securely transmissions occur between farmers and experts while maintaining transparency of vendor transactions?
- What methodology would provide a decentralized, secure and transparent platform for this purpose?

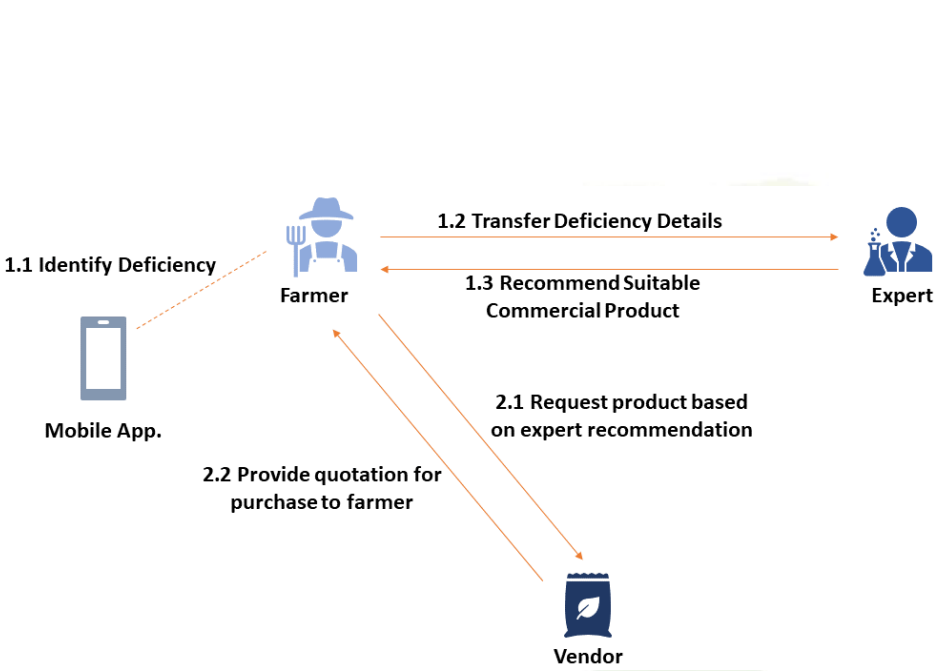
# OBJECTIVES

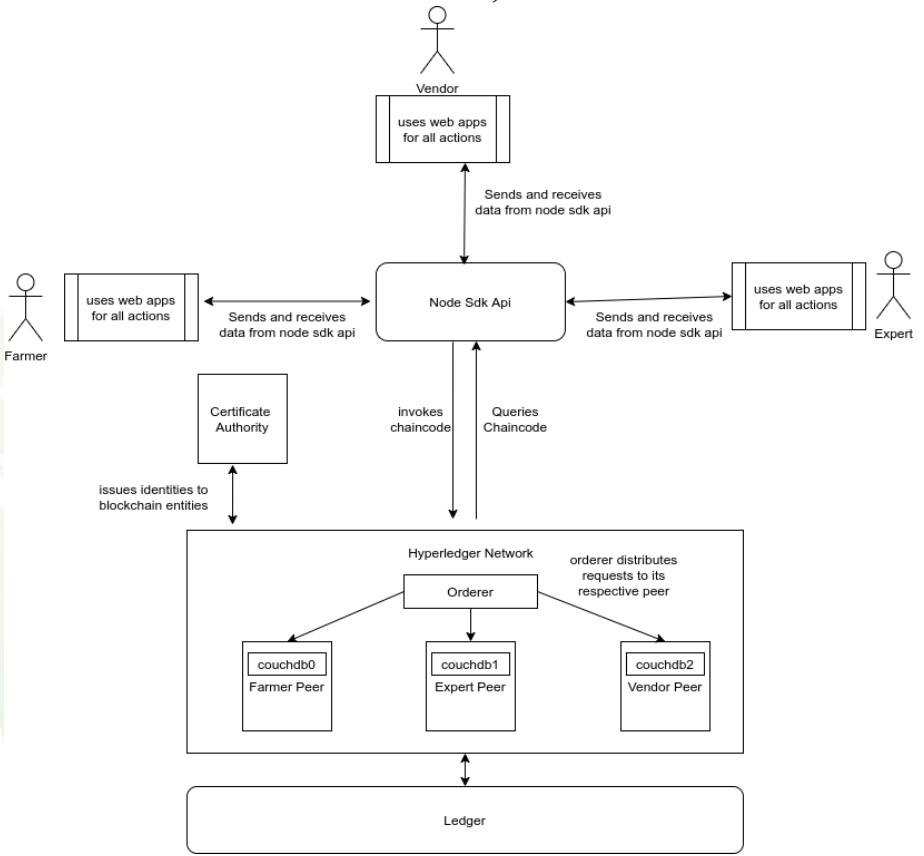

Enhance Information access for farmers
Utilize Expert Knowledge Effectively
Lift information asymmetry lift bias toward vendor
Generate better Fertilization practices and conserve soil constitution
Streamline Fertilizer Procurement using a decentralized approach

# BLOCKCHAIN WORKFLOW: UNDERSTAND WHY BLOCKCHAIN

1. A Transaction is sent to a peer to peer network
2. This transaction is verified using a pre-agreed consensus process
3. The verified transaction is added to other (previous) transactions which creates a new block of data
4. This Block is then added to the existing chain of data blocks in a permanent manner and cannot be changed
5. Every stakeholder in the network has same copy of data stored in local computer/assigned cloud storage

# METHODOLOGY - SYSTEM DIAGRAM



# ACHIEVEMENT

01

- Constructing a decentralized ledger based system to replicate the existing trust-driven centralized system

02

- Enabling better information access to farmers, enabling RAS in compliance to MDGs

03

- Proposing and constructing a successful system to lift bias toward intermediaries in a purchasing ecosystem

# Demonstration