

A Precision Agriculture Technique for Optimum Irrigation in Tomato Plant



Pritam Gurung (PAS075BGE030)

Roshan Kafle(PAS075BGE033)

Samir Pahari (PAS075BGE035)

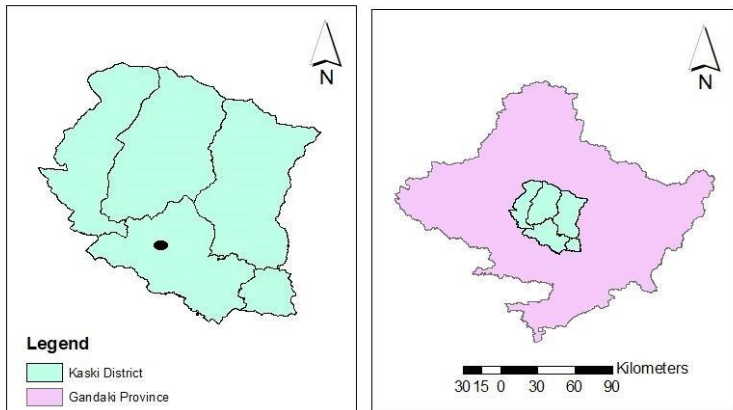
Sujan Adhikari (PAS075BGE043)

OBJECTIVES

To identify the suitable amount of Water or moisture for high productivity of tomato.



Study Area Map

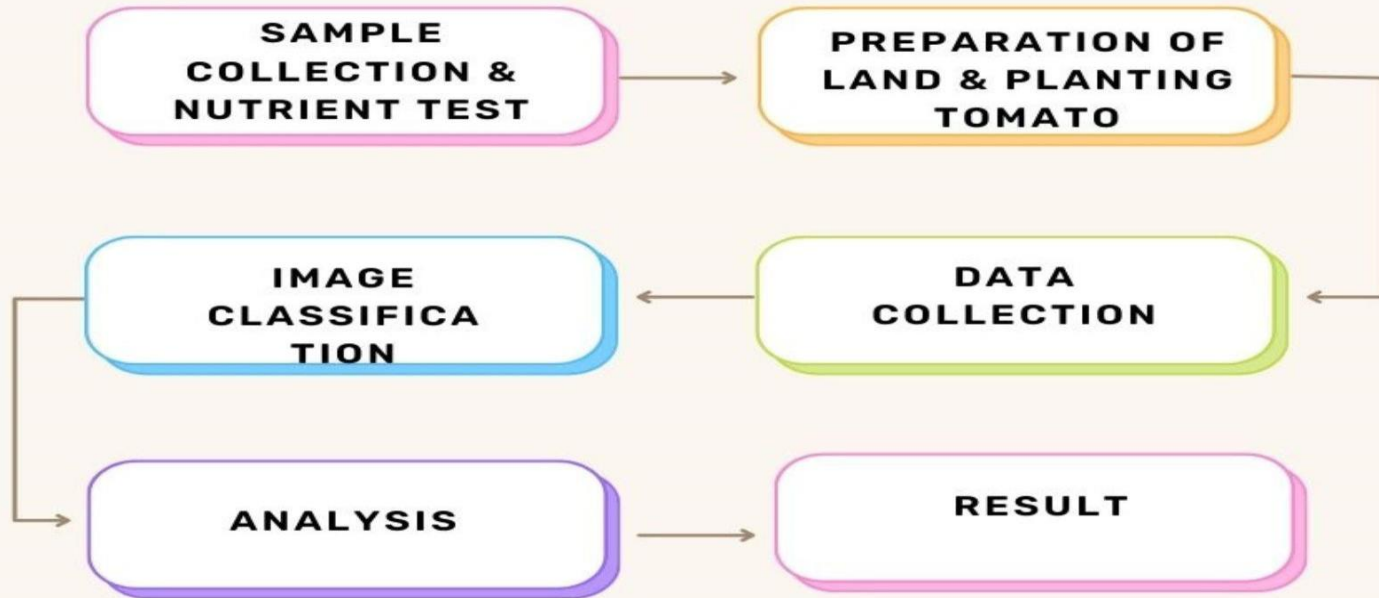


Prepared By: Sankalpa Dhakal

STUDY AREA



METHODOLOGY



Soil Sample Collection



- Using handheld auger
 - From top soil
- From five different parts on the field

pH value	Nitrogen (%)	Phosphorus (kg/hect)	Potassium (kg/hect)
Normal = 7.1	Less= 0.04	Medium = 31.98	Medium = 139.92

Preparation of land

- 150kg of FYM was added along with 9.518kg urea,

2.68kg DAP and 3.17kg MOP.



- Total 5 Plots each contains 3 subplots. ($5 \times 3 = 15$ subplots)

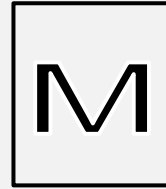
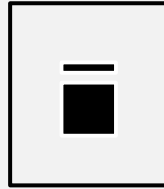
Irrigation



- Divided into different plot 25%, 50%, 75% and 100% field capacity.

Data Collection

Image Capturing



Soil Moisture

Fruit Yield



Image Capturing

By DSLR Camera



By Mobile Phone



Figure: Sample image of leaf of tomato plants.

Soil Moisture

Table : Moisture Data

Date	Plot A	Plot B	Plot C	Plot D	Plot E	Plot F	Plot G	Plot H	Plot I	Plot J	Plot K	Plot L	Plot M	Plot N	Plot O
4/30/2079	18.7	22.4	16.6	19.5	24.7	14.4	15.4	20.2	18.6	13.1	17.2	10.3	23.1	25.2	18.5
5/8/2079	22.3	23.1	18.5	22.7	29.3	15.3	19.7	24.6	24.3	22.5	19	14.9	13.8	22.4	18.7
5/23/2079	16.6	18.8	21.2	14.7	13.8	9.9	12.9	20.5	13.9	12.6	22.4	20.3	16.3	11.1	20.2
6/2/2079	10.5	16.8	15.7	13.5	24.5	10.6	11.9	20.2	9	23.1	23.7	21.5	12.8	14.4	22.6
6/13/2079	15.5	20.3	19	17	20.3	12.9	17.3	18.4	13.8	16.4	13.4	20.5	11.5	14.6	19.7
6/27/2079	28.1	23.3	18	21.5	21.4	14.6	24	14	16.9	12.4	13.4	22.4	7.1	9.2	22.4
7/6/2079	16.6	18.8	21.2	14.7	13.8	9.9	12.9	20.5	13.9	12.6	22.4	20.3	16.3	11.1	20.2
7/14/2079	18.7	16.8	15.7	13.5	24.5	10.6	11.9	20.2	9	23.1	23.7	21.5	12.8	14.4	22.6
7/20/2079	20.2	23.1	20.3	16.3	11.1	15.3	19.7	24.6	29.3	22.5	19	14.9	13.8	22.4	18.7
7/30/2079	19.7	18.8	21.5	12.8	14.4	9.9	12.9	9.9	12.9	20.5	22.4	20.3	16.3	11.1	20.2
8/7/2079	15.5	20.3	7.1	17	20.3	12.9	17.3	18.4	24.5	16.4	13.4	20.5	11.5	14.6	19.7

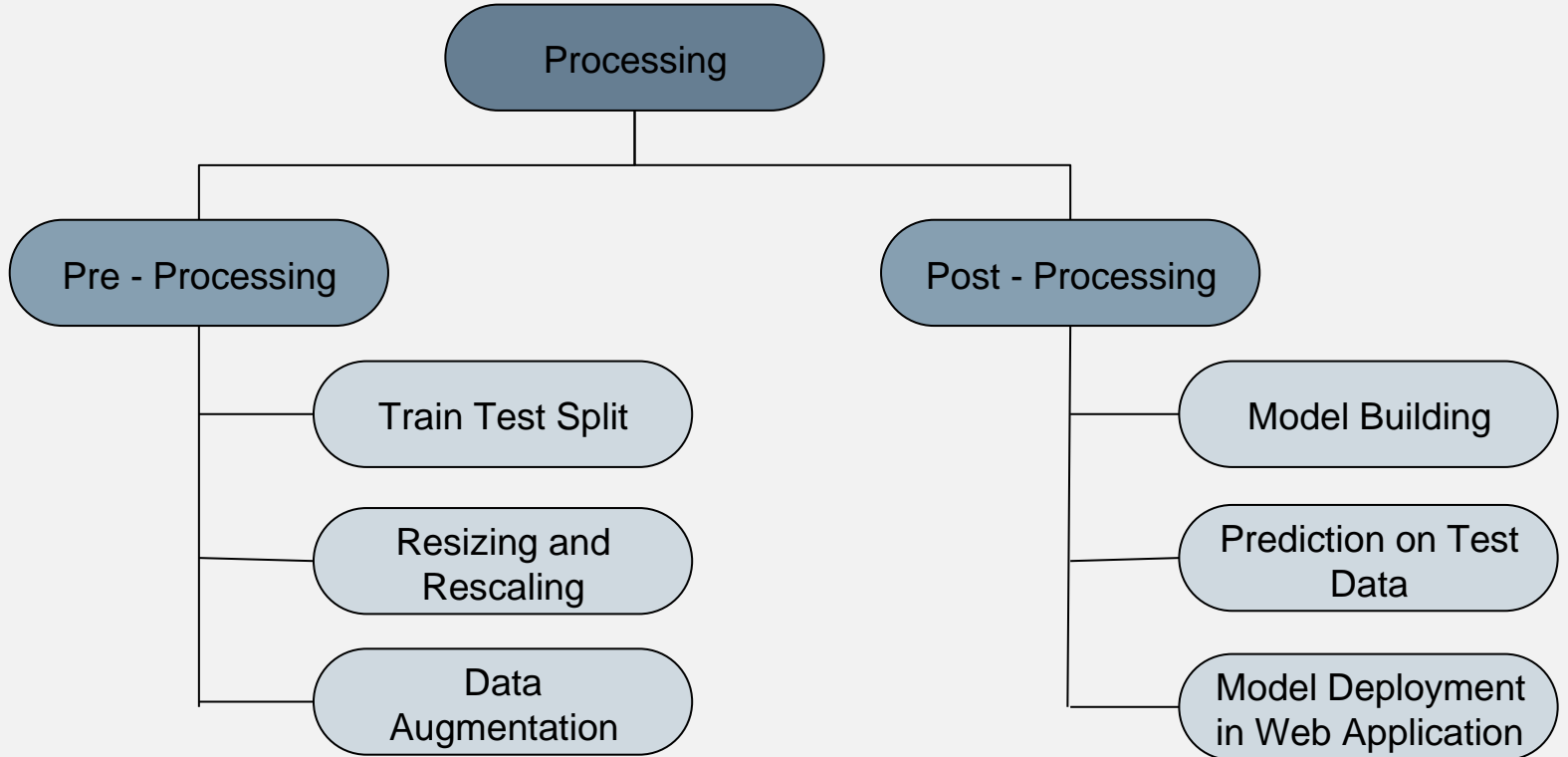
Fruit yield

Date	Plot A	Plot B	Plot C	Plot D	Plot E	Plot F	Plot G	Plot H	Plot I	Plot J	Plot K	Plot L
6/29/2079	0.712	0.712	0.396	1.512	1.418	0.724	0.642	0.66	0.452	0.404	0.566	0.604
7/1/2079	0.76	1.478	1.29	2.654	2.654	1.48	0.438	1.316	1.884	0.896	2.502	0.752
7/5/2079	1.98	0.614	1.338	1.748	1.888	1.178	1.264	0.884	1.946	1.298	1.528	1.164
7/11/2079	1.556	2.216	2.636	5.443	3.646	3.556	2.558	2.78	1.484	1.894	1.814	1.946
7/15/2079	1.214	2.168	3.864	1.423	1.448	1.508	0.432	1.556	0.45	1.566	0.574	1.208
8/8/2079	1.86	1.29	0.498	0.934	1.838	0.288	1.186	1.888	0.15	1.864	0.62	0.428
Sum	8.082	8.478	10.022	13.714	12.892	8.734	6.52	9.084	6.366	7.922	7.604	6.102
	100% Field Capacity			75% Field Capacity			50% Field Capacity			25% Field Capacity		

DATA ARRANGEMENT

The screenshot shows a Windows File Explorer window with the title bar 'FINAL YEAR PROJECT DATA'. The ribbon at the top has 'File', 'Home', 'Share', and 'View' tabs. The address bar shows the path: 'This PC > New Volume (D:) > DEEP LEARNING > FINAL YEAR PROJECT DATA >'. The left sidebar shows a tree view of folders under 'New Volume (D:)', with 'DEEP LEARNING' selected. The main pane displays a table of folders.

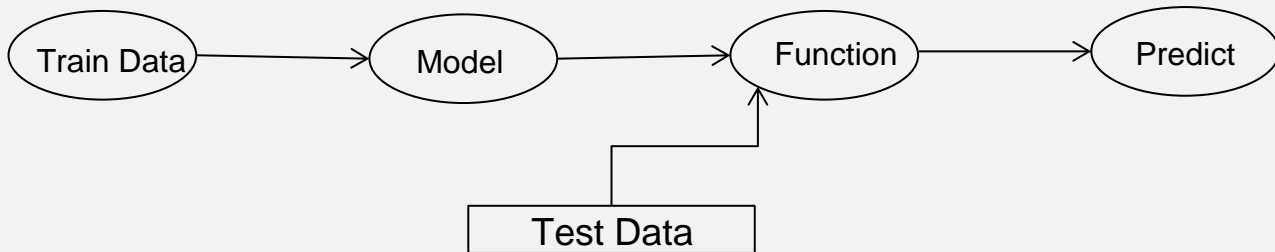
Name	Date modified	Type	Size
25% FIELD CAPACITY	11/25/2022 4:27 PM	File folder	
50% FIELD CAPACITY	11/25/2022 4:27 PM	File folder	
75% FIELD CAPACITY	11/25/2022 4:27 PM	File folder	
100% FILED CAPACITY	11/25/2022 4:27 PM	File folder	
DISEASED LEAVES	11/25/2022 4:27 PM	File folder	



Data Splitting

Training Dataset (80%)

Inputs to train a model.



Testing Dataset (10%)

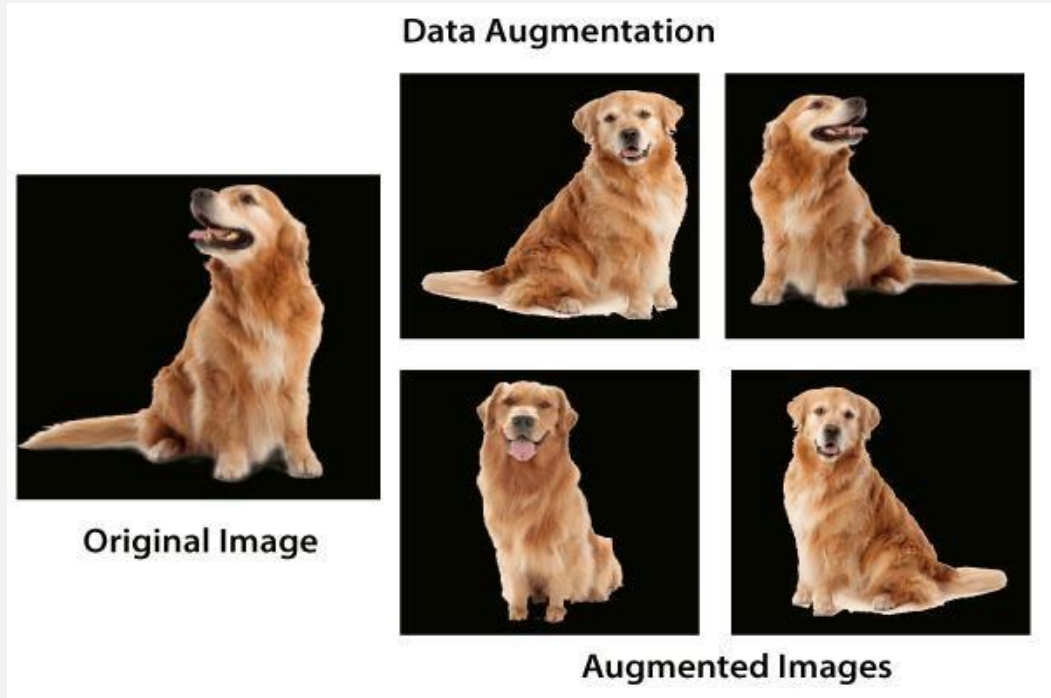
Inputs to predict or check the performance of the model.

Validation Dataset (10%)

Model hyper parameter tuning and create new function.

Pre - Processing

- RESIZING
- RESCALING • DATA AUGMENTATION



CNN

Input

4	9	2	5	8	3
→	6	2	4	0	3
	4	5	4	5	2
5	6	5	4	7	8
5	7	7	9	2	1
5	8	5	3	8	4

$$n_H \times n_W = 6 \times 6$$

Filter

1	0	-1
1	0	-1
1	0	-1

*

Parameters:

Size: $f = 3$

Stride: $s = 1$

Padding: $p = 0$

=

Result

2	6		

6 = $9 \times 1 + 2 \times 0 + 5 \times (-1) +$
 $6 \times 1 + 2 \times 0 + 4 \times (-1) +$
 $4 \times 1 + 5 \times 0 + 4 \times (-1)$

Filter

-1	-1	-1
2	2	2
-1	-1	-1

Horizontal lines

-1	2	-1
-1	2	-1
-1	2	-1

Vertical lines

-1	-1	2
-1	2	-1
2	-1	-1

2	-1	-1
-1	2	-1
-1	-1	2

Horizontal Filter



Transfer Learning

ResNet50



MobileNet

Xception

Keras Application

VGG19

for

DensNet

NASNet

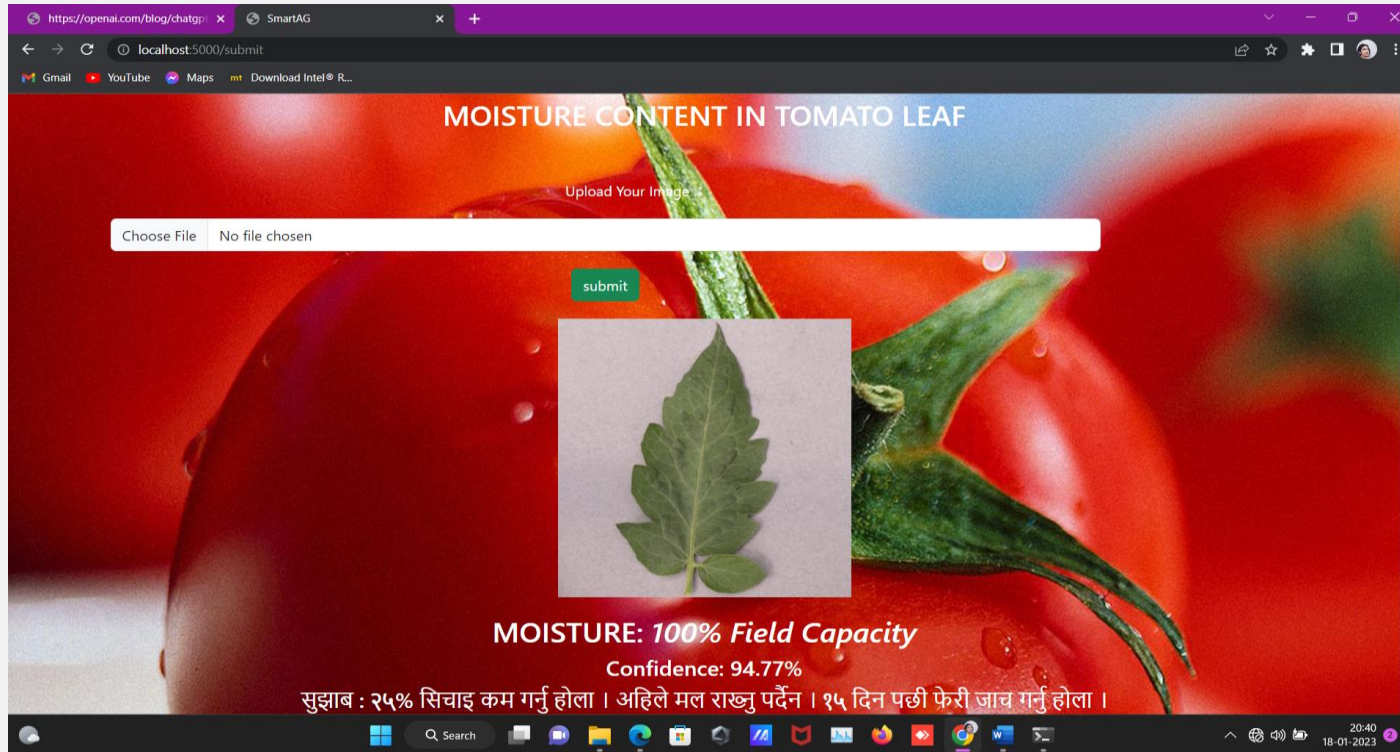
Pre-trained Model

InceptionV3

MobileNetV2

VGG16

Web App



TIMELINE

Proposed Timeline

June

- Soil sample collection
- Nutrient test of soil
- Preparation of land
- Planting plants

**June to
September**

- Capturing picture of leaves
- Data collection of chlorophyll, moisture in soil, soil nutrients

**September to
December**

- Machine Learning
- Image classification
- Analysis on Productivity

**THANK
YOU**

