Project Presentation Stage

H.A.R.N. Hydro-farming with Autonomous Regulation of Nutrients

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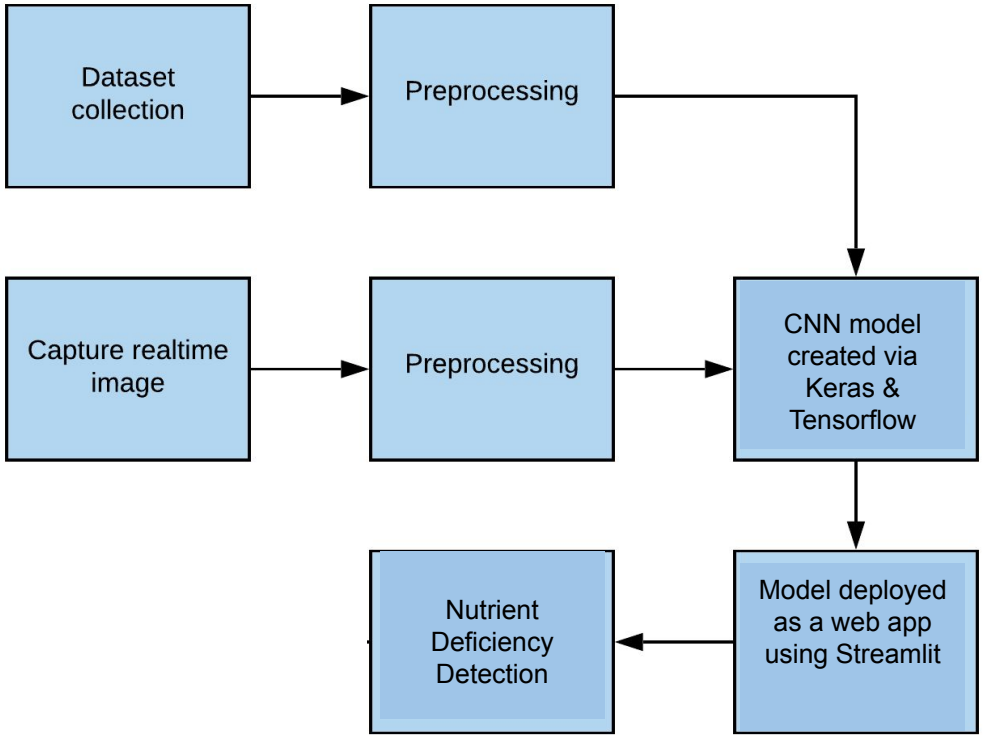
Methodology



Rice Dataset Images

A.

B.

C.

D.

Fig. A. Healthy Rice Leaf

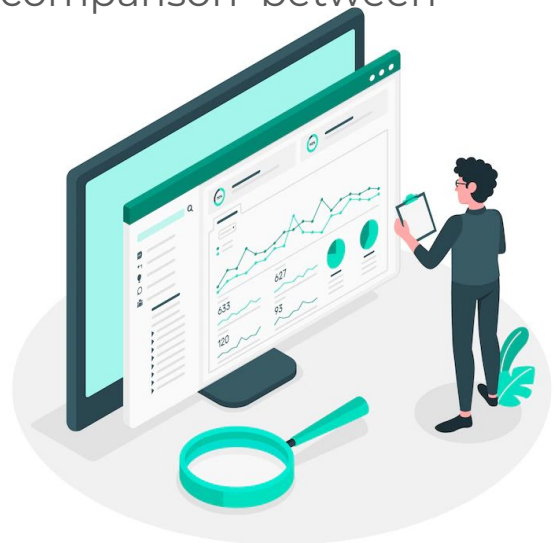
Fig. B. Potassium (K) Deficiency in Rice Leaf

Fig. C. Nitrogen (N) Deficiency in Rice Leaf

Fig. D. Phosphorus (P) Deficiency in Rice Leaf

Model Implementation

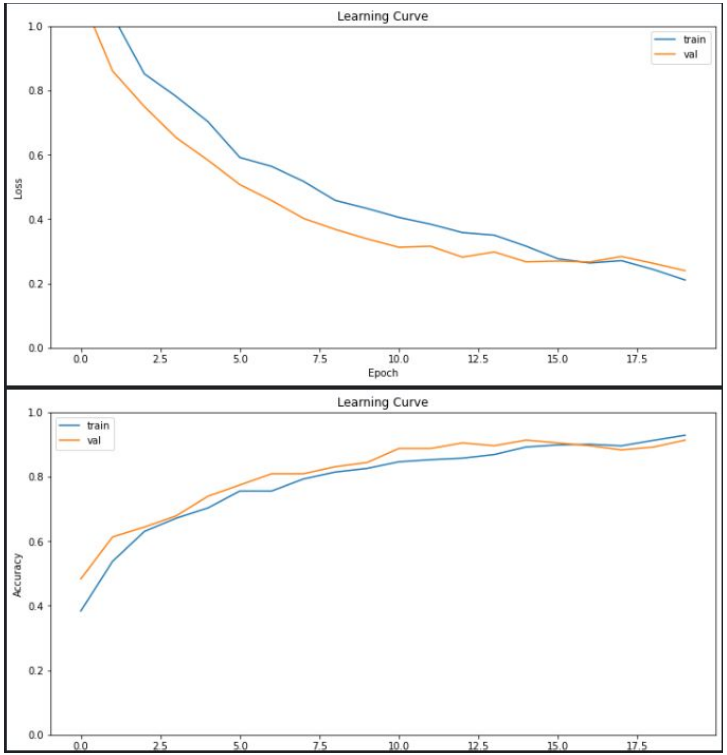
- Implemented various architectures such as InceptionV3, VGG16, Xception, etc on rice nutrient deficiency dataset.
- Created our own custom model for rice dataset, achieving outstanding result
- Model were implemented on rice nutrient deficiency classification dataset and spinach disease classification dataset
- Graphs were plotted to better understand the model
- Accuracy and *F1 score* were calculated in order to do comparison between various models.



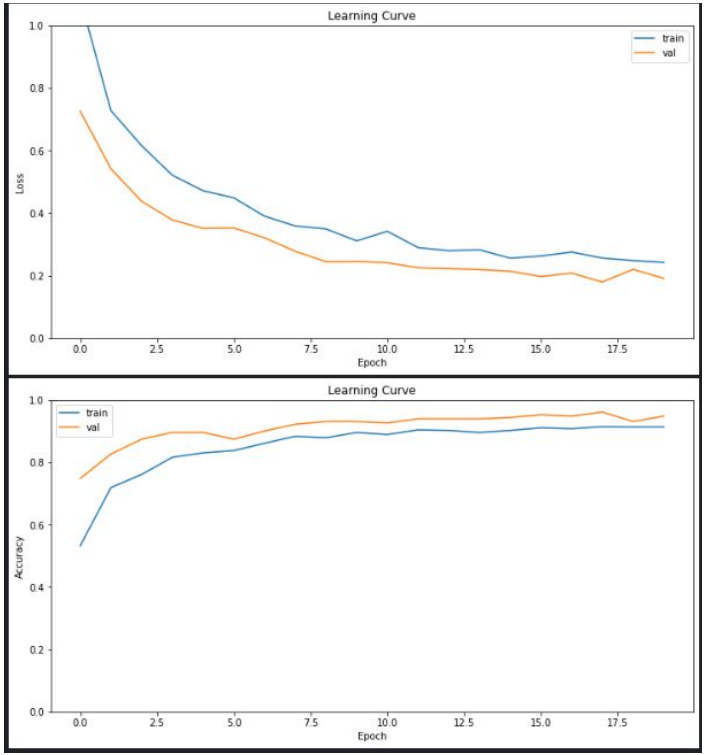
Comparison of different models used

Metrics	F1 Score	Train Accuracy	Test Accuracy	Validation Accuracy	Cohen Kappa Score
Models					
Custom Model	0.9175	0.871	0.917	0.887	0.8891
VGG16	0.9217	0.964	0.922	0.935	0.8951
Xception	0.9389	0.962	0.939	0.948	0.918
InceptionV3	0.9527	0.968	0.952	0.913	0.9358

Graphs Based on Models Used



Inception V3



Xception

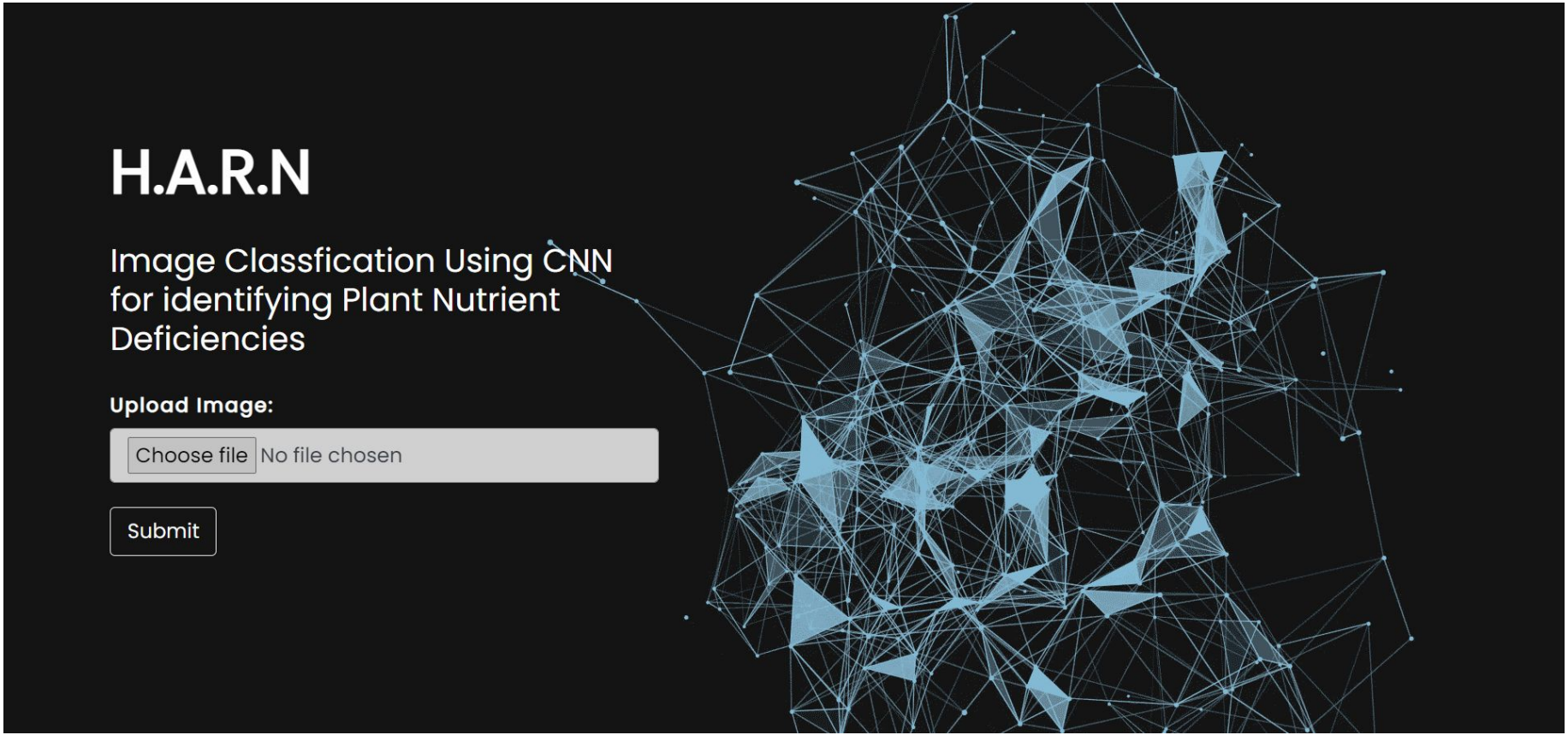
Model Deployment

- We will be creating a Web App to provide a interface for real time identification of plant nutrient deficiencies in plants.
- Web app will be made using Flask and Heroku
- HTML and CSS is used to create the UI for Web App
- Streamlit will be used to run functions at backend level
- Heroku will be used to deploy the model on a providing the URL for us to access anytime

[Rice Nutrient Deficiency Classifier]

[Spinach Classification]

Web App User Interface for H.A.R.N.



Spinach Plant Dataset Creation

- Obtained images of healthy spinach leaves (68 images)
- Obtained unhealthy (Diseased) spinach leaf images through Web Scraping (49 images)
- Started getting Deficiency images for spinach
- Image augmentation was performed on healthy and unhealthy spinach leaves
  - Healthy Augmented - 217 images
  - Unhealthy Augmented - 320 images
- Obtaining rice plant dataset from IEEE research paper

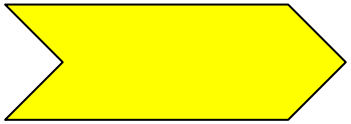
Spinach Dataset Images

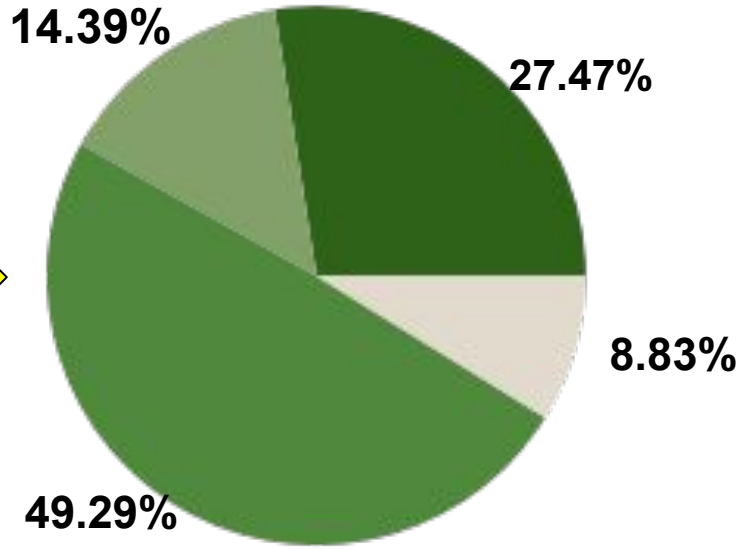
A. Healthy Spinach Leaves

B. Unhealthy Spinach Leaves

Deficient Area Calculation Using cv2

- Pixel value identification technique known as contour is used to calculate area of nutrient deficiency in leaf.
- Moreover K-Means Clustering also one of the image segmentation Method which gives the percentage of particular color intensity.
- This technique can further be used to set threshold for percent nutrient deficiency in a plant along with stage wise nutrient split up




14.39%
27.47%
8.83%
49.29%

Future Work

- Deficient Area Calculation Using cv2
- This technique can further be used to set threshold for percent nutrient deficiency in a plant along with stage wise nutrient split up
- Conversion of Web App that is created into Mobile App