RICE DISEASE CLASSIFIER

Computer Vision

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- Rice is one of the staple foods of most countries in Asia especially in South East region.

- Rice hold a significant role. Any disruption due to crop diseases in rice production can significantly affect both local economies and food availability.

- High demand on rice means rice plant sector has to come up with strategic plans to maintain food security and sufficiency.

Background

Proposed Solution

Rice Plant Diseases Classifier App

- Accepts image of rice plant leaf as an input.

- Classifies image into 4 distinct classes.

- Help detect early state of the disease.

- Gives insights regarding the detected disease along side with treatment recommendations.

- Contribute to SDG 2 Zero Hunger by minimizing crop loss and ensuring food security.

- Web based application.

Data Collection

Kaggle 1 (3000+ images):
- Healthy
- Hispa
- Brownspot
- Bacterial Leaf Blight
- Leaf Blast

Data Mendeley (4000+ images):
- Brownspot
- Bacterial Leaf Blight
- Leaf Blast

Kaggle 2 (2000+ images):
- Healthy
- Narrow Brown Spot
- Brownspot
- Bacterial Leaf Blight
- Leaf Blast
- Leaf Scald

UC Irvine (120 images):
- Brownspot
- Bacterial Leaf Blight
- Leaf Smut
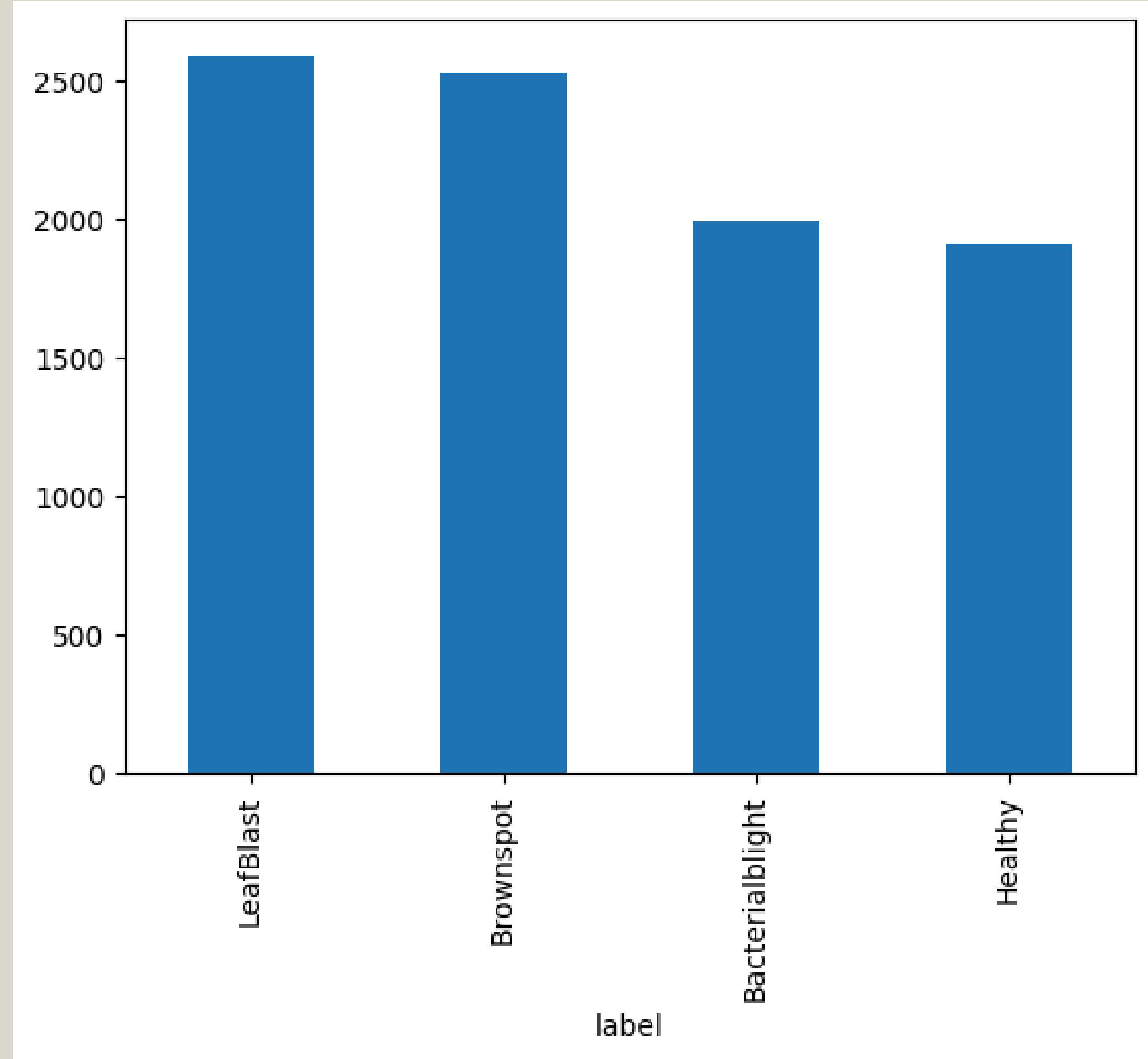
Classes Picked:
Healthy, Brownspot, Bacterial Leaf Blight & Leaf Blast
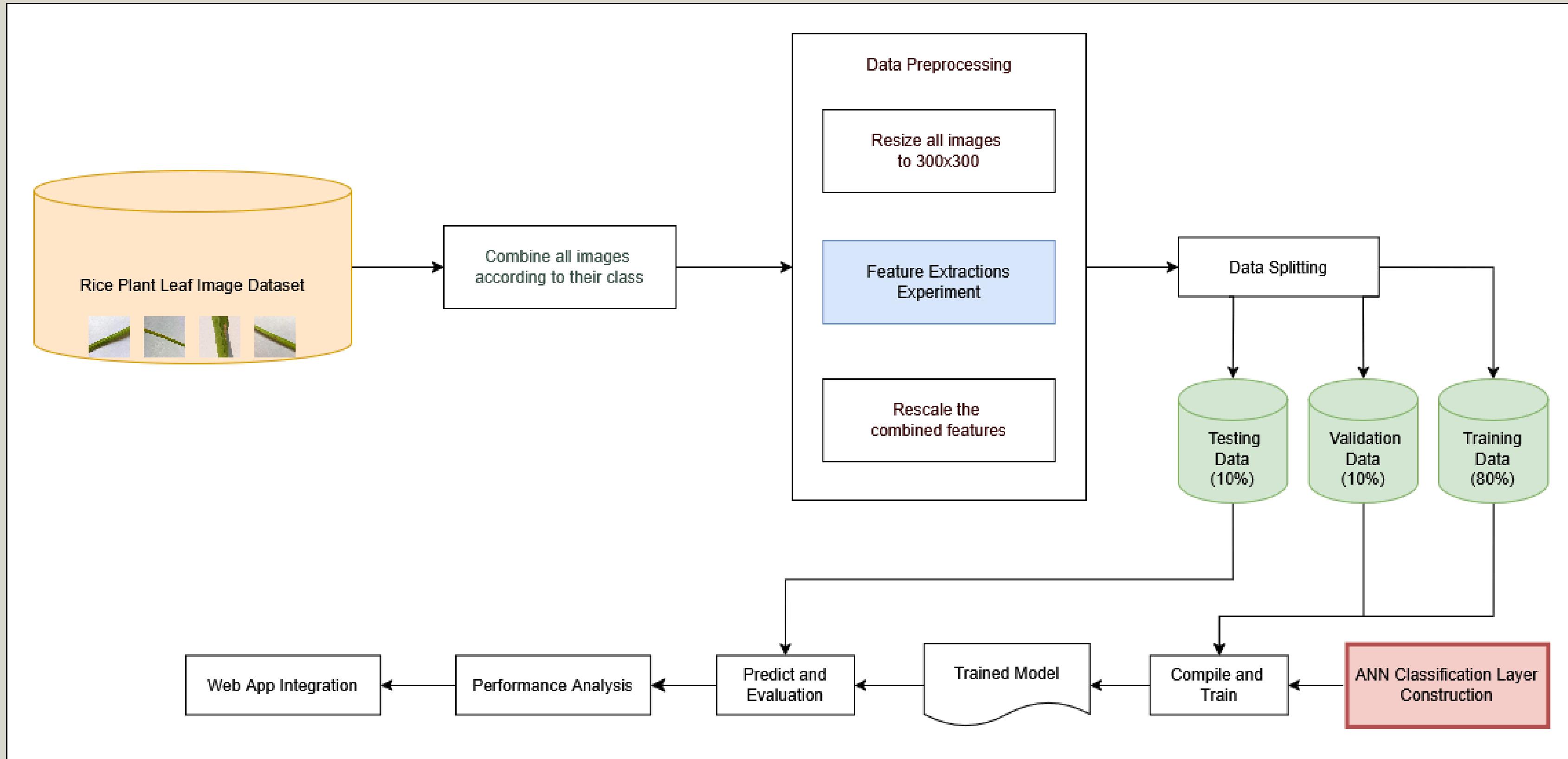
Data Collection
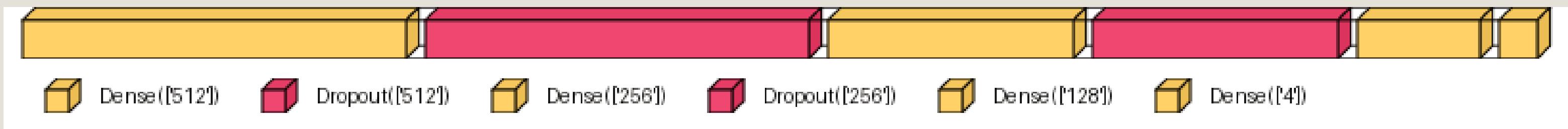
Data
Collection

Project Pipeline

ANN Architecture (Classifier)


```python
model = Sequential()
input_dim = rescaled_features.shape[1]

model.add(Dense(512, activation='relu', input_shape=(input_dim,)))
model.add(Dropout(0.3))
model.add(Dense(256, activation='relu'))
model.add(Dropout(0.3))
model.add(Dense(128, activation='relu'))
model.add(Dense(num_classes, activation='softmax'))
```

- Optimizer = Adam → learning rate = 0.001
- Loss = Categorical cross entropy

Experiment - 1

COLOR (HSV HISTOGRAM)

Processes the image by analyzing its color distribution in terms of Hue, Saturation, and Brightness rather than simple Red Green Blue values.

SHAPE (HU MOMENTS)
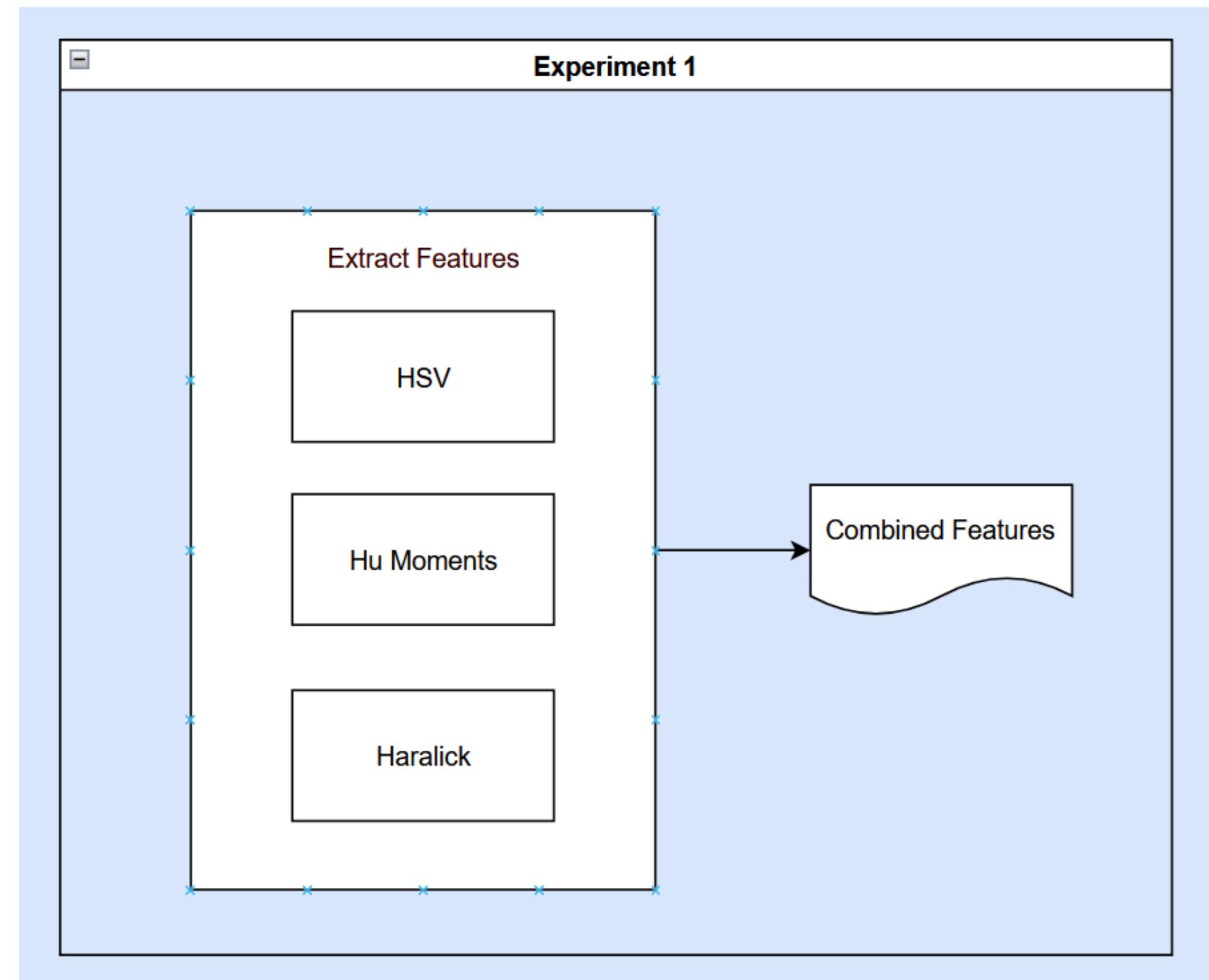
Extract the fundamental geometry of an object by calculating statistical weighted averages of its silhouette or contour
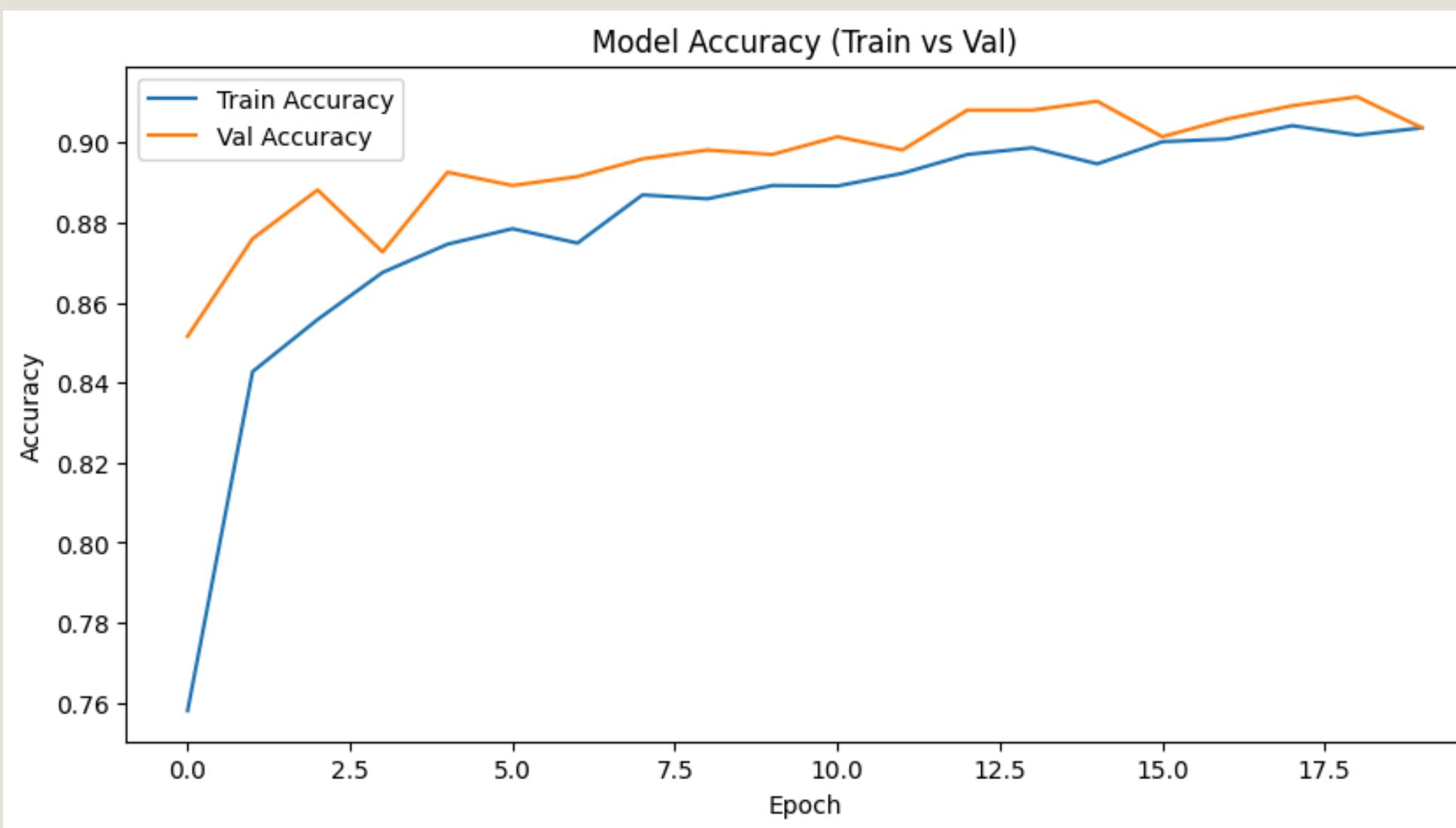
TEXTURE (HARALICK FEATURES)

A set of statistical numbers that calculated contrast, homogeneity, energy, and correlation

Experiment - 1

Experiment - 1

Model Accuracy (Train vs Val)

	precision	recall	f1-score	support
Bacterialblight	0.98	1.00	0.99	200
Brownspot	0.93	0.93	0.93	253
Healthy	0.76	0.90	0.82	191
LeafBlast	0.92	0.79	0.85	259
accuracy			0.90	903
macro avg	0.90	0.90	0.90	903
weighted avg	0.90	0.90	0.90	903

Experiment - 2

COLOR (HSV HISTOGRAM)

Processes the image by analyzing its color distribution in terms of Hue, Saturation, and Brightness rather than simple Red Green Blue values.

SHAPE (HU MOMENTS)

Extract the fundamental geometry of an object by calculating statistical weighted averages of its silhouette or contour
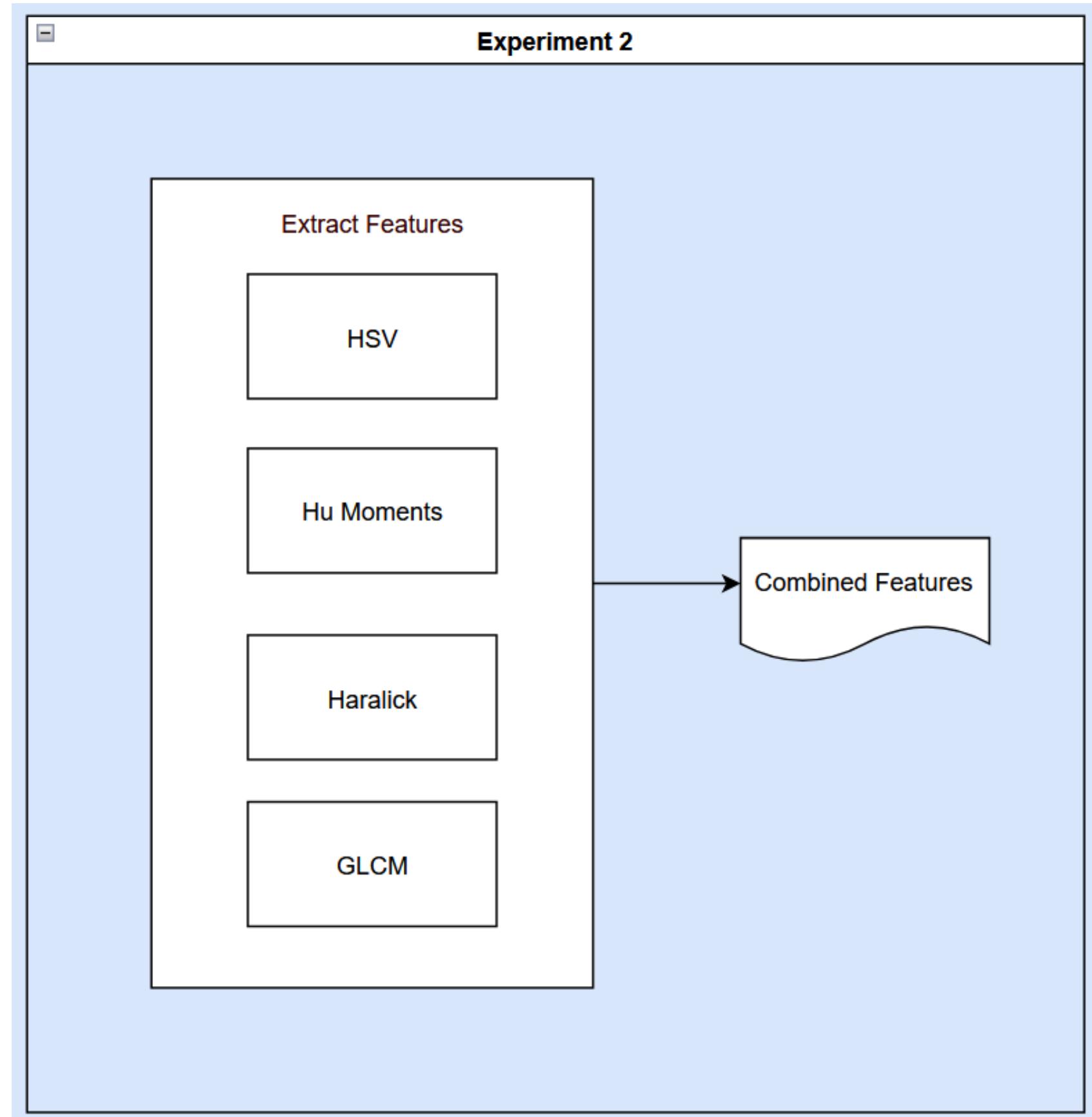
TEXTURE (HARALICK FEATURES)

A set of statistical numbers that calculated contrast, homogeneity, energy, and correlation
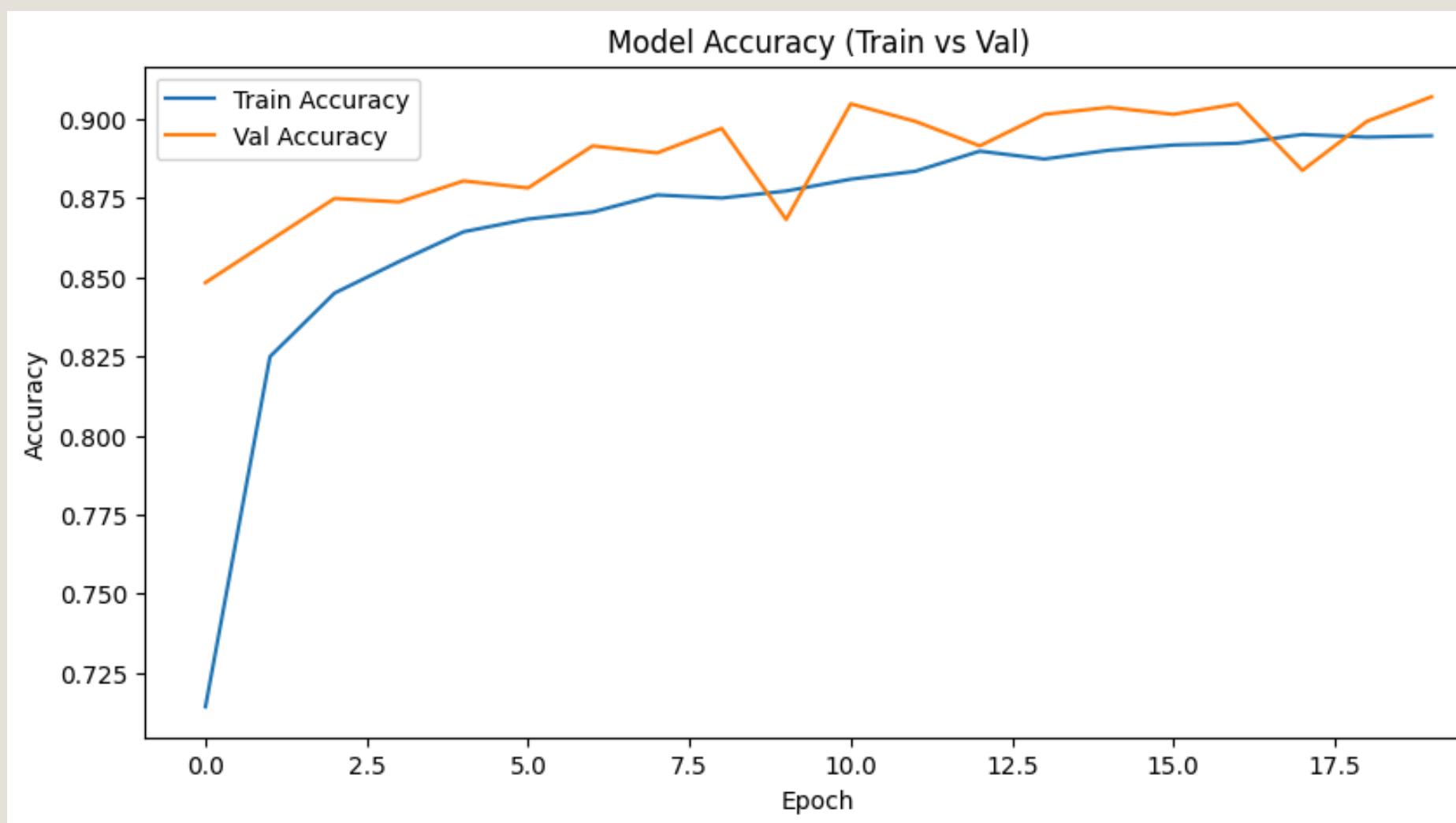
TEXTURE (GLCM)

A matrix that counts how often pixel patterns occur next to each other and to captures the spatial relation between pixels.

Experiment - 2

Experiment - 2

Model Accuracy (Train vs Val)

|	precision	recall	f1-score	support
Bacterialblight	0.97	1.00	0.99	200
Brownspot	0.95	0.91	0.93	253
Healthy	0.74	0.91	0.81	191
LeafBlast	0.93	0.78	0.85	259
accuracy			0.89	903
macro avg	0.90	0.90	0.89	903
weighted avg	0.90	0.89	0.89	903

Experiment - 3
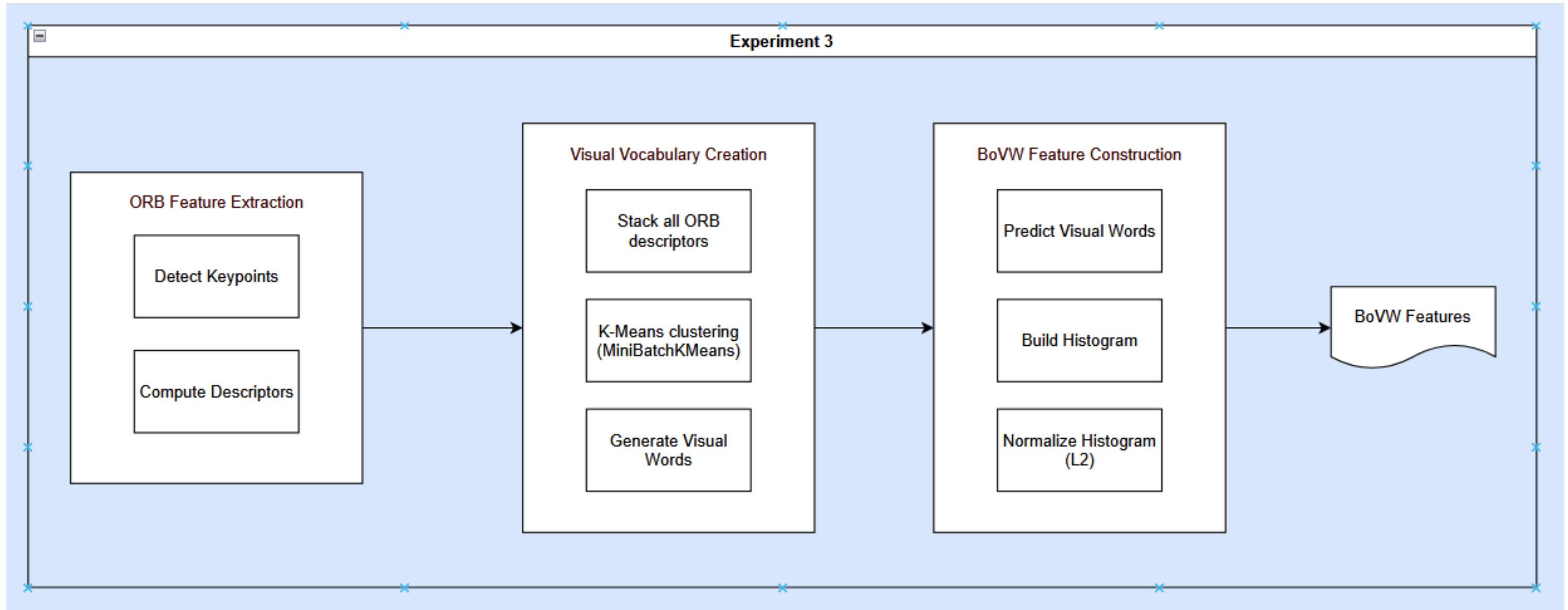
ORB

To scans the image to detect and describe specific keypoints, such as sharp corners, edges, or distinct points of interest
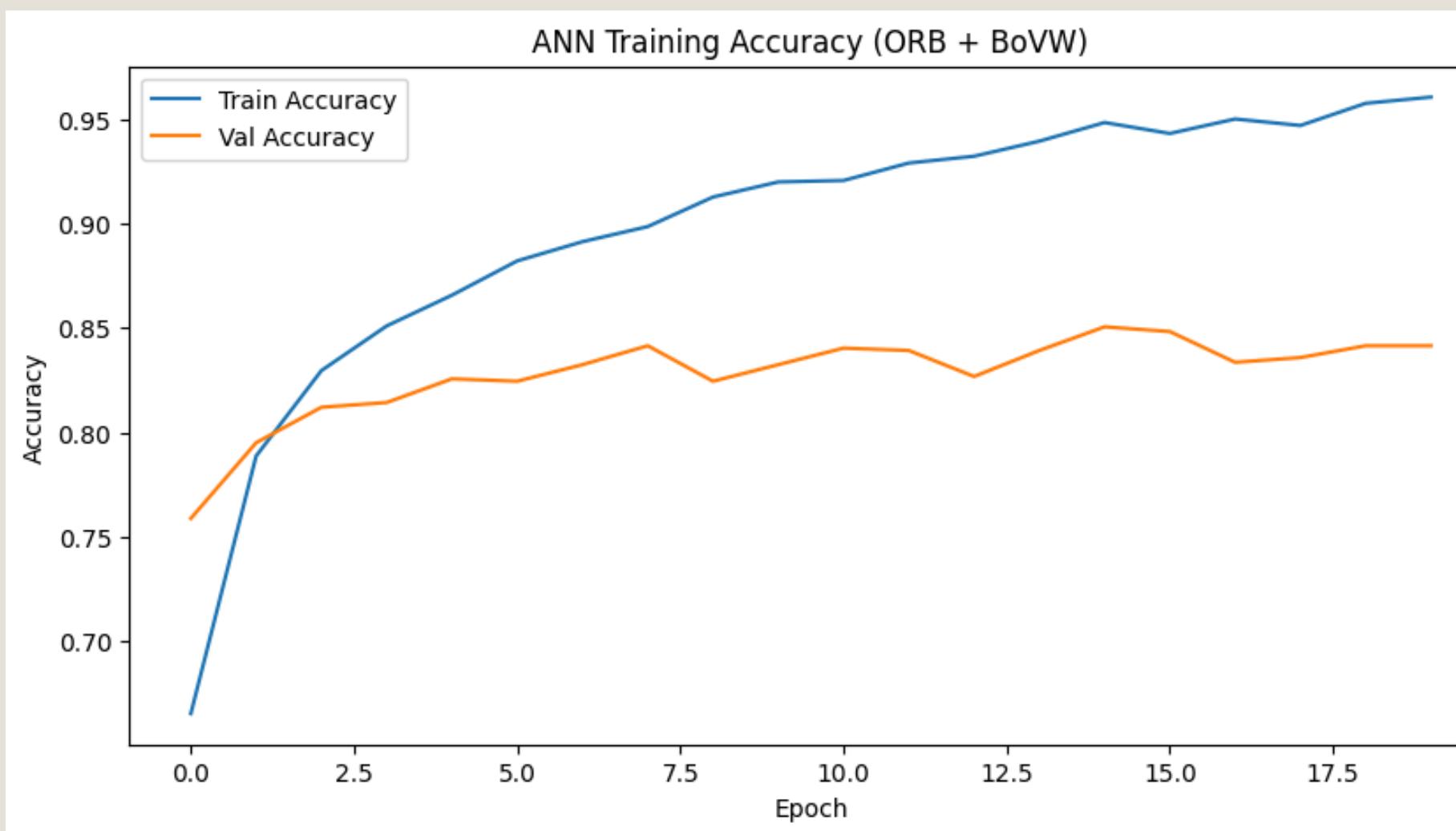
BOVW

To groups similar patterns into clusters and counts their frequency, transforming the scattered local details of an image into a fixed length histogram that the Neural Network can read

Experiment - 3

Experiment - 3

ANN Training Accuracy (ORB + BoVW)
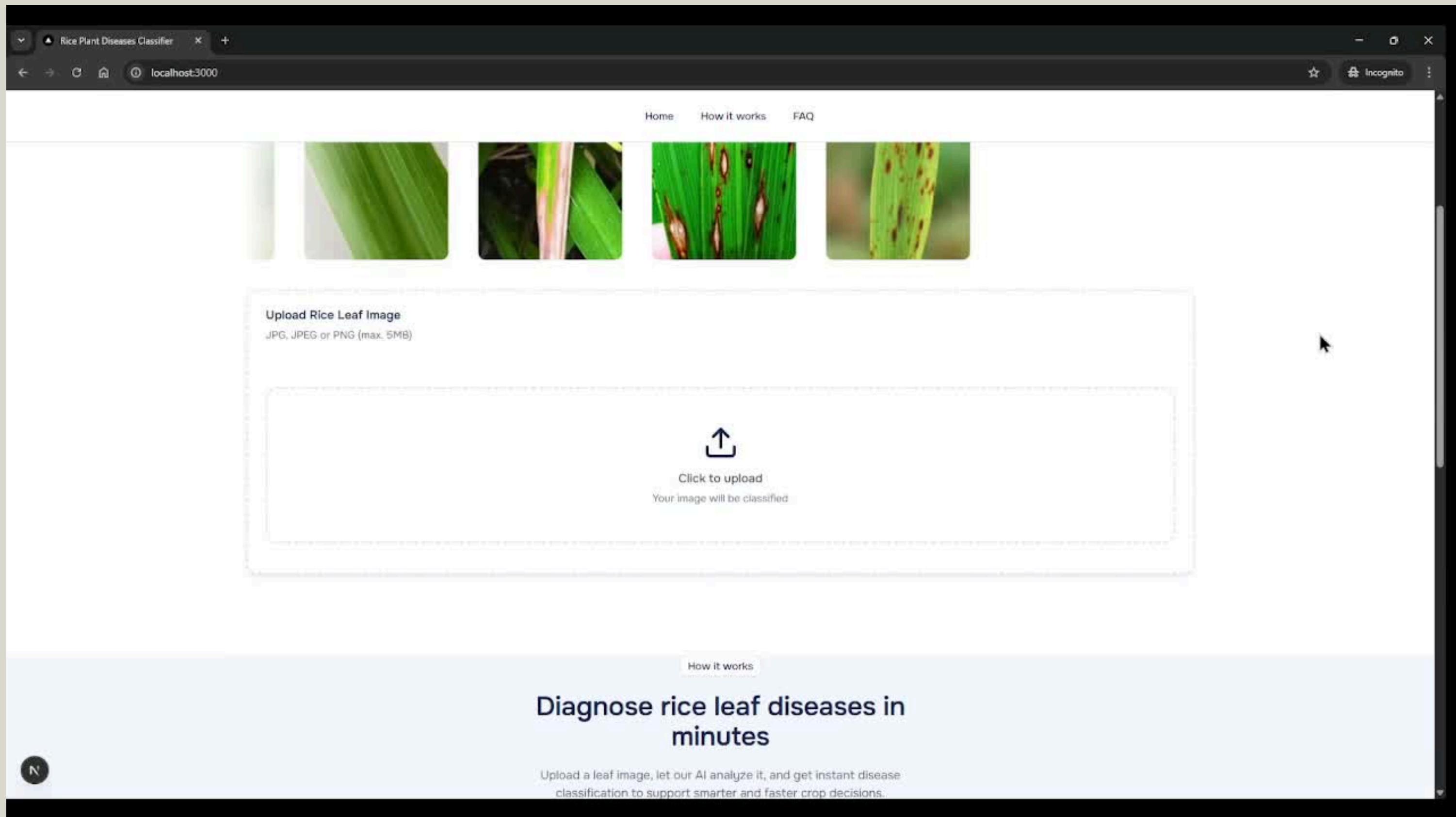
```
Classification Report:
                  precision    recall  f1-score   support

Bacterialblight       0.95      0.94      0.95       200
    Brownspot         0.90      0.84      0.87       244
      Healthy         0.74      0.90      0.81       188
    LeafBlast         0.87      0.79      0.83       252

     accuracy                             0.86       884
    macro avg         0.87      0.87      0.86       884
 weighted avg         0.87      0.86      0.86       884
```

DEMO

Contributors

Pieter Allen

- Research and clean data
- Try different feature extraction techniques
- Train and Test
- Organize Github repository
- Build Frontend

Fernando Gunawan

- Try different feature extraction techniques
- Construct ANN classifier architecture
- Train and Test
- Build Backend
- Demo

Thank You.

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