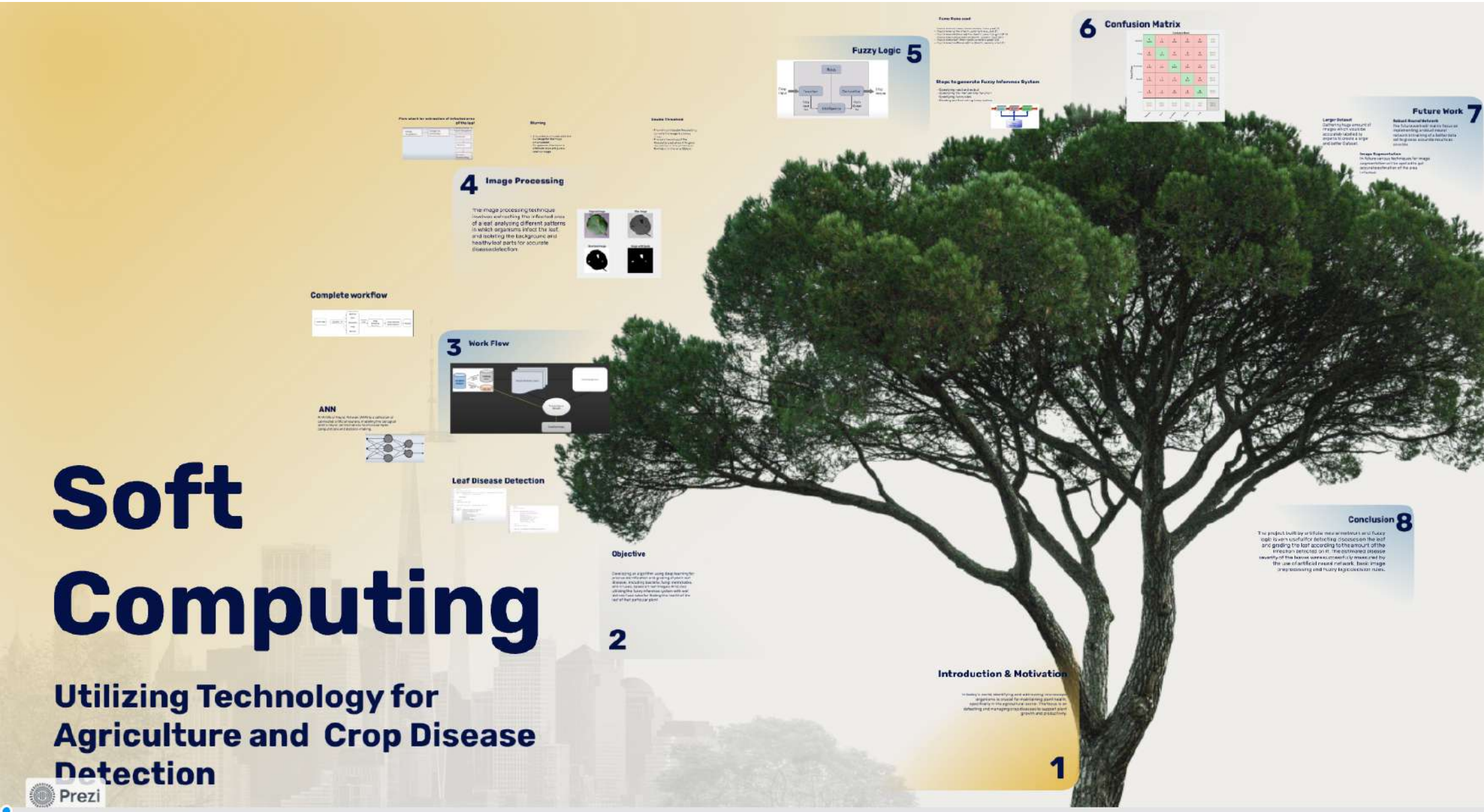
Soft Computing

Utilizing Technology for Agriculture and Crop Disease Detection

Prezi

Loading content...



Introduction & Motivation

In today's world, identifying and addressing microscopic organisms is crucial for maintaining plant health, specifically in the agricultural sector. The focus is on detecting and managing crop diseases to support plant growth and productivity.

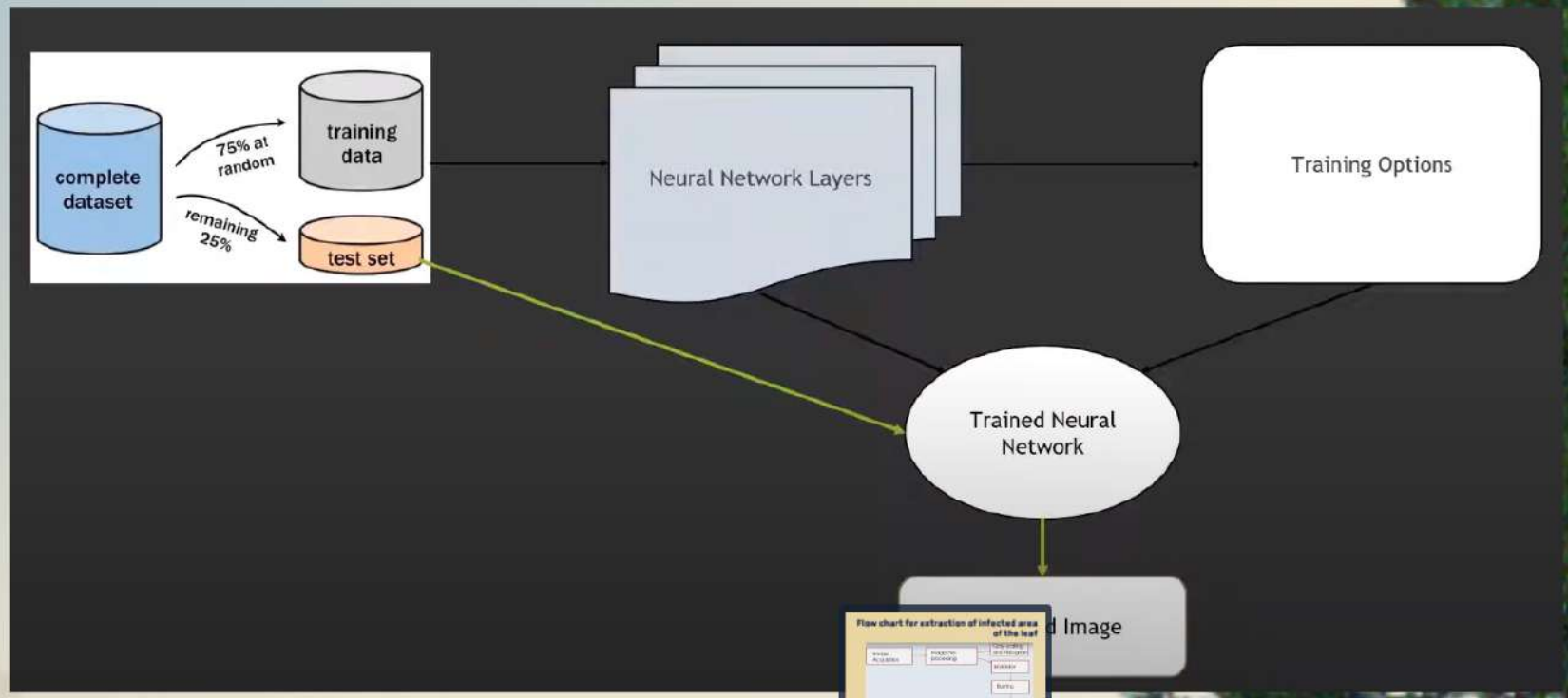
1

Objective

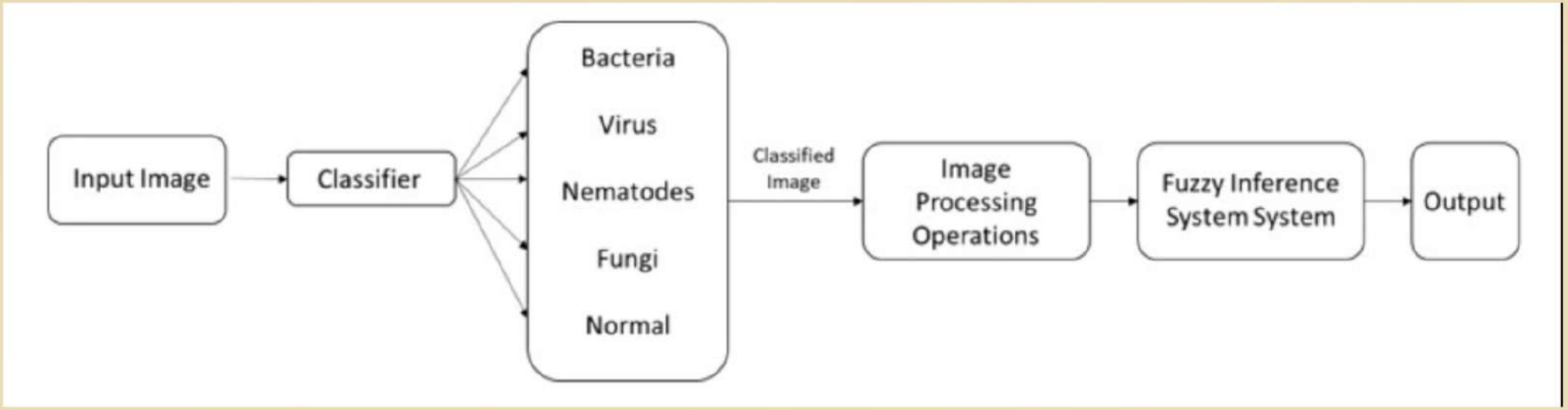
Developing an algorithm using deep learning for precise identification and grading of plant leaf diseases, including bacteria, fungi, nematodes, and viruses, based on leaf images. And also utilizing the fuzzy inference system with well defines Fuzz rules for finding the health of the leaf of that particular plant.

2

3 Work Flow

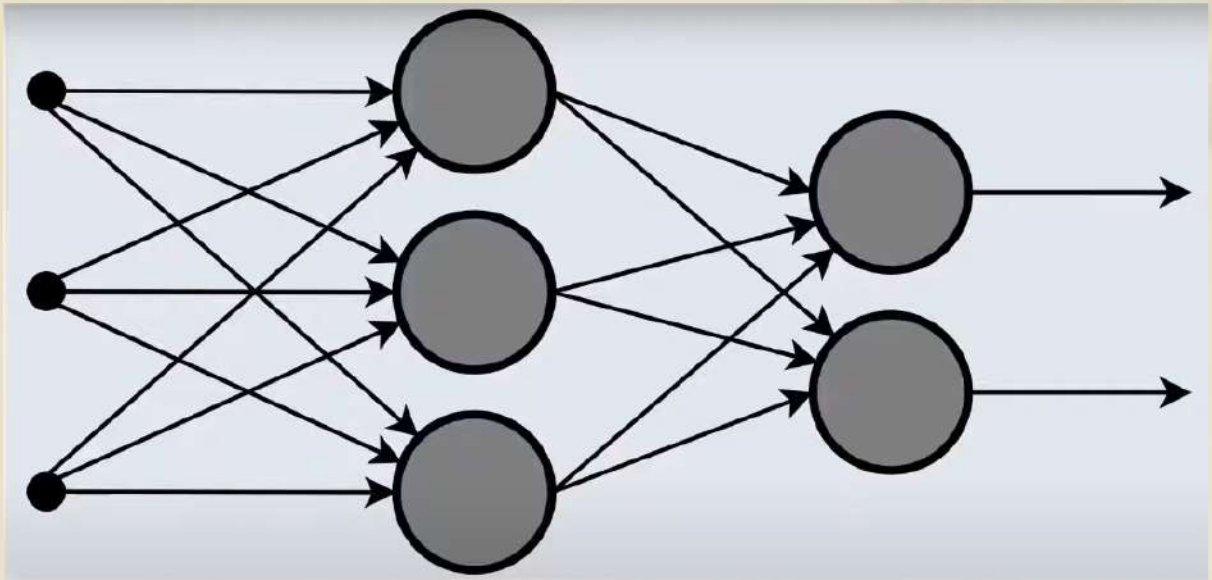


Complete workflow



ANN

An Artificial Neural Network (ANN) is a collection of connected artificial neurons, modeling the biological brain's neural connections to facilitate complex computations and decision-making.



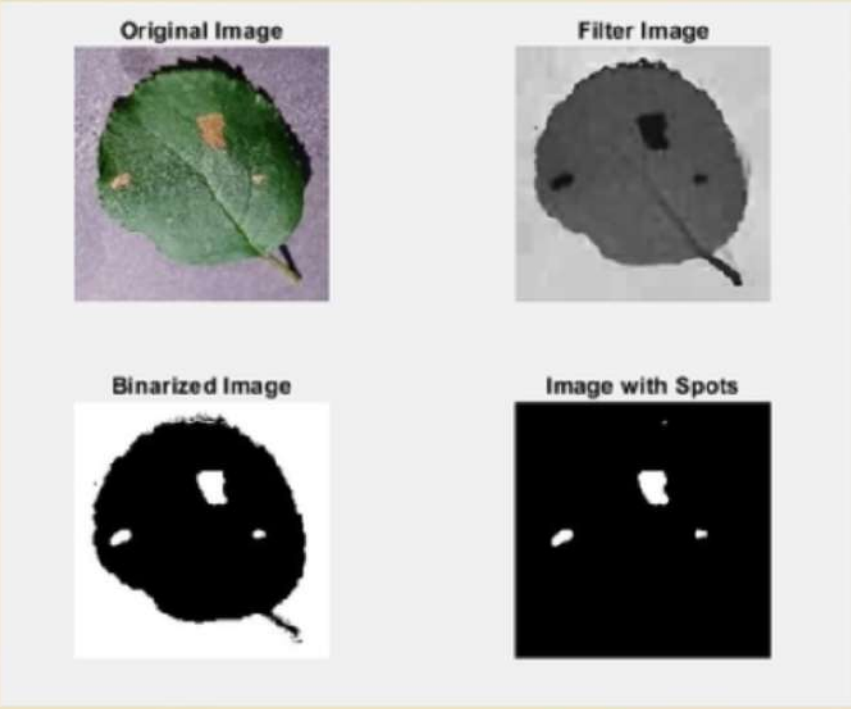
Leaf Disease Detection

```
%Step 1
%Creating a datastore
imds = imageDatastore('Leaf_Disease_Dataset','IncludeSubfolders',true,...
        'LabelSource','foldernames');

    disp(imds);

% %Step 2
% %Splitting the data

[traindata,testdata] = splitEachLabel(imds,0.8);

%Step 3
layer = [imageInputLayer([256 256 3])
        convolution2dLayer(5,20)
        reluLayer
        maxPooling2dLayer(2, 'Stride', 2)
        fullyConnectedLayer(5)
        softmaxLayer
        classificationLayer
        ];
```

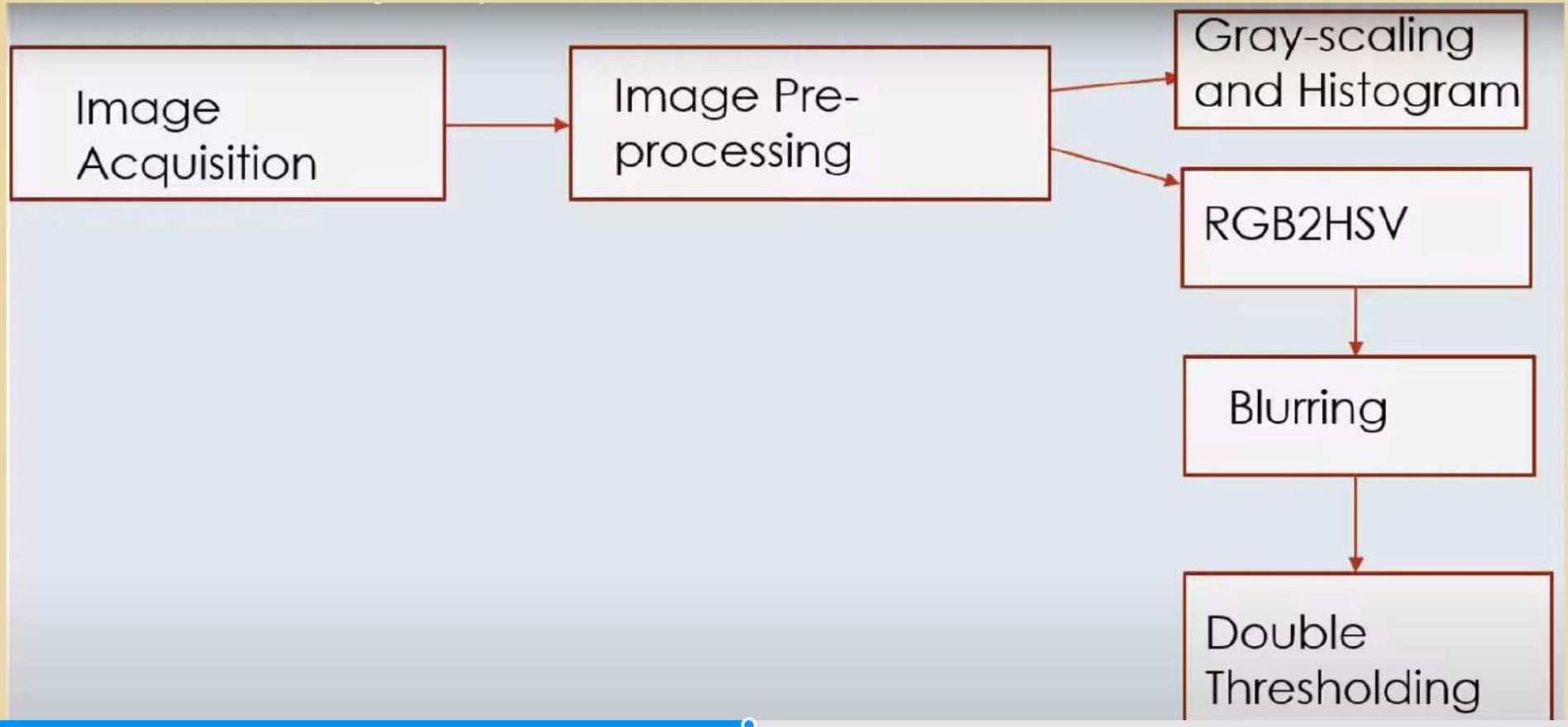
```
%Step 4
%Training options

options = trainingOptions('rmsprop', ...
          'Plots', 'training-progress', ...
          'LearnRateSchedule', 'piecewise', ...
          'MaxEpochs',30, ...
          'LearnRateDropFactor', 0.4, ...
          'LearnRateDropPeriod',7, ...
          'MiniBatchSize', 300);
          %options.MaxEpochs = 30;

 %Step 5
 %Training the network

 [net,info] = trainNetwork(traindata,layer,options);

 save net net
```

4 Image Processing

The image processing technique involves extracting the infected area of a leaf, analyzing different patterns in which organisms infect the leaf, and isolating the background and healthy leaf parts for accurate disease detection.



Flow chart for extraction of infected area of the leaf



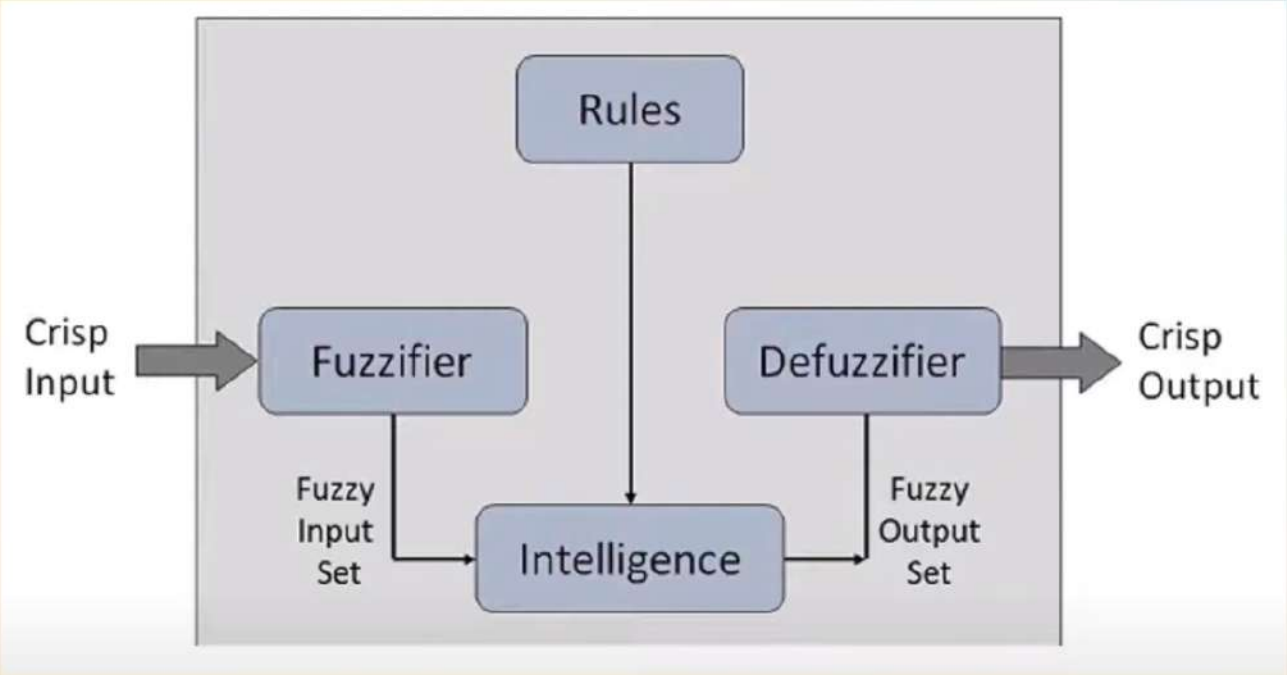
Blurring

- A Gaussian blur is applied to the hue image for the image enhancement.
- The gaussian filter helps to eliminate noise and gives a smother image

Double Threshold

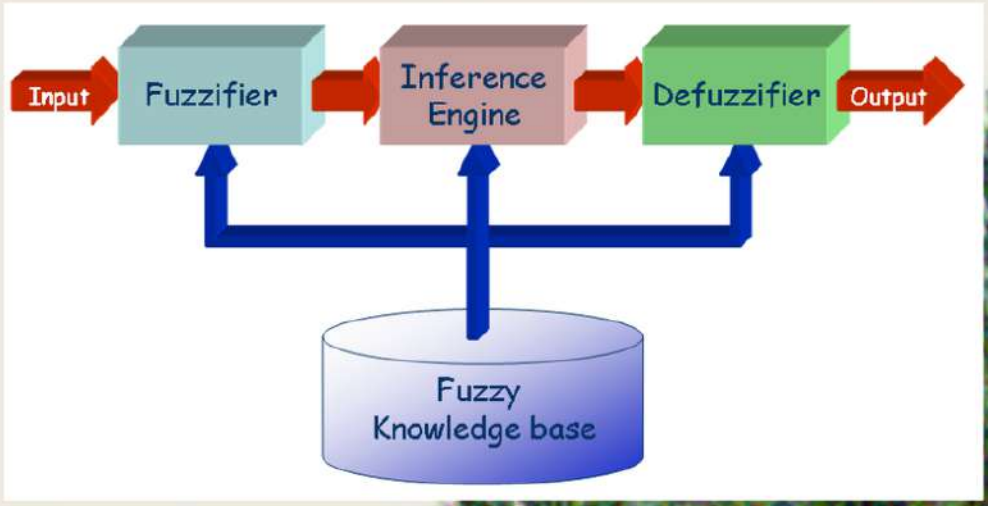
- The method of double thresholding converts the image to a binary image.
- There are two values of the thresholds used where if the pixel lies between it, it is converted to 1(white) and otherwise 0(black)

Fuzzy Logic 5



Steps to generate Fuzzy Inference System

- Specifying input and output
- Specifying the membership function
- Specifying Fuzzy rules
- Reading and Evaluating fuzzy system



Fuzzy Rules used

- If (spots is less/No) then (health severity is very good) (1)
- If (spots is many) then (health_severity is very_bad) (1)
- If (spots is less/No(Inverse)) then (health_severity is good) (0.5)
- If (spots is many(inverse)) then (health_seventy is bad) (0.5)
- If (spots is medium1) then (health_severity is good) (0.5)
- If (spots is medium1(inverse)) then (health_seventy is bad) (1)

6 Confusion Matrix

Future Work 7

Larger Dataset
Gathering huge amount of images which would be accurately labelled by experts to create a larger and better Dataset.

Robust Neural Network
The future work will mainly focus on implementing a robust neural network in training of a better data set to give as accurate results as possible.

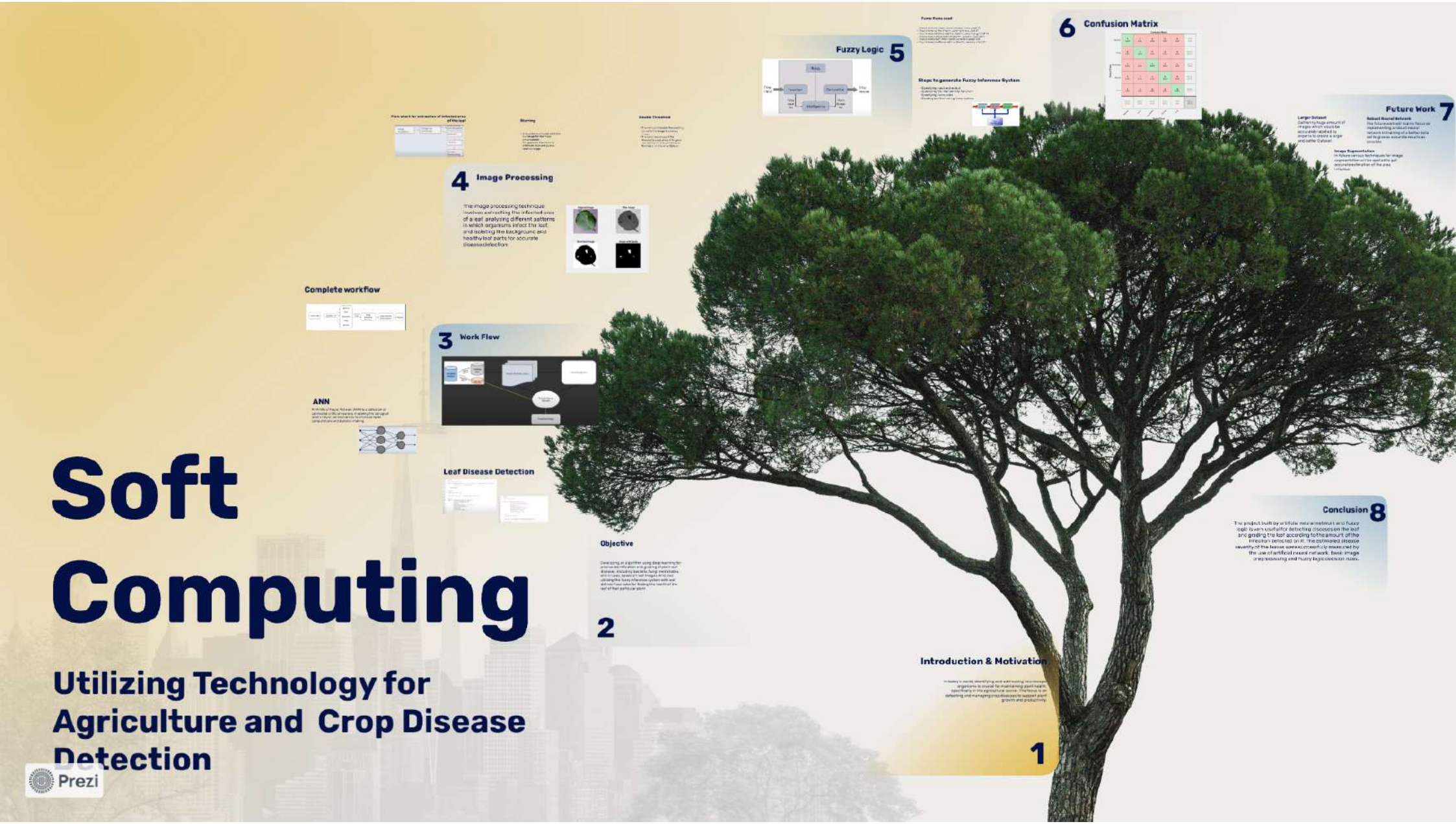
Image Segmentation
In future various techniques for image segmentation will be applied to get accurate estimation of the area infected.

Conclusion 8

The project built by artificial neural network and fuzzy logic is very useful for detecting diseases on the leaf and grading the leaf according to the amount of the infection detected on it. The estimated disease severity of the leaves were successfully measured by the use of artificial neural network, basic image preprocessing and Fuzzy logic decision rules.

Soft Computing

Utilizing Technology for Agriculture and Crop Disease Detection



Prezi