

**Bacterial foraging optimization based Radial Basis
Function Neural Network (BRBFNN) for
identification and classification of plant leaf
diseases: An automatic approach towards Plant
Pathology**

**MICANS
TECH**

Abstract

- The contribution of a plant is highly important for both human life and environment. Plants do suffer from diseases, like human beings and animals. There is the number of plant diseases that occur and affects the normal growth of a plant. These diseases affect complete plant including leaf, stem, fruit, root, and flower. Most of the time when the disease of a plant has not been taken care of, the plant dies or may cause leaves drop, flowers and fruits drop etc. Appropriate diagnosis of such diseases is required for accurate identification and treatment of plant diseases. Plant pathology is the study of plant diseases, their causes, procedures for controlling and managing them. But, the existing method encompasses human involvement for classification and identification of diseases.

- This procedure is time-consuming and costly. Automatic segmentation of diseases from plant leaf images using soft computing approach can be reasonably useful than the existing one. In this paper, we have introduced a method named as Bacterial foraging optimization based Radial Basis Function Neural Network (BRBFNN) for identification and classification of plant leaf diseases automatically. For assigning optimal weight to Radial Basis Function Neural Network (RBFNN) we use Bacterial foraging optimization (BFO) that further increases the speed and accuracy of the network to identify and classify the regions infected of different diseases on the plant leaves. The region growing algorithm increases the efficiency of the network by searching and grouping of seed points having common attributes for feature extraction process. We worked on fungal diseases like common rust, cedar apple rust, late blight, leaf curl, leaf spot, and early blight. The proposed method attains higher accuracy in identification and classification of diseases.

Contd..

- Computers have evolved to be a vital device in a number of applications like defense, medical, agriculture, engineering etc. with its ability to process multimedia information like images captured from some computing devices.
- An image contains important information that can be retrieved by using some computational method. Image segmentation is a task for partitioning an image into smaller parts that are more meaningful.
- Interestingly, it can be stated as identification and classification of some region of interest. The segmentation is performed based on some common properties of the objects present in an image like color, texture and, shape etc.
- Image segmentation is a preprocessing step for image processing generally performed by using two methods (i) Traditional method and (ii) Soft computing method.

EXISTING SYSTEM-PROBLEM

- There is the number of plant diseases that occur and affects the normal growth of a plant. These diseases affect complete plant including leaf, stem, fruit, root, and flower. Most of the time when the disease of a plant has not been taken care of, the plant dies or may cause leaves drop, flowers and fruits drop.
- Appropriate diagnosis of such diseases is required for accurate identification and treatment of plant diseases. Plant pathology is the study of plant diseases, their causes, procedures for controlling and managing them. But, the existing method encompasses human involvement for classification and identification of diseases.

PROPOSED SYSTEM

- we have introduced a method named as Bacterial foraging optimization based Radial Basis Function Neural Network (BRBFNN) for identification and classification of plant leaf diseases automatically.
- For assigning optimal weight to Radial Basis Function Neural Network (RBFNN) we use Bacterial foraging optimization (BFO) that further increases the speed and accuracy of the network to identify and classify the regions infected of different diseases on the plant leaves.
- The region growing algorithm increases the efficiency of the network by searching and grouping of seed points having common attributes for feature extraction process.

Hardware requirements

- Processor - Pentium –III
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB
- Floppy Drive - 1.44 MB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

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Software requirements

- Operating System - Windows 7/8
- Application Server - Tomcat 5.0
- Front End - JAVA
- IDE - NETBEANS 7.1
- Back-End - HEIDISQL 3.5

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Screen short

BRBF FOR IDENTIFICATION AND CLASSIFICATION

TECH

plantdisease.avi - VLC media player
Media Playback Audio Video Subtitle Tools View Help

BRBFNN for identification and classification of plant leaf diseases

Neural Network Training

Disease testing

00:50 05:40

11:13 28-Aug-18

TRAINING SESSION:

ACH

plantdisease.avi - VLC media player
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Training Session

Load Image Folder

Blast

Feature Extract

Start Training

```
graph TD; A[Normal plant leaf images] --> B[Image preprocessing]; C[Leaf image with diseases] --> B; B --> D[Feature extraction using Region growing method]; D --> E[Training Dataset]; D --> F[Test Dataset]; E --> G[BFO based optimization]; G --> H[Training of RBFNN using BFO]; H --> I{Termination Condition met}; I -- NO --> H; I -- YES --> J[RBFNN]; J --> K[Network output];
```

Normal plant leaf images

Leaf image with diseases

Image preprocessing

Feature extraction using Region growing method

Training Dataset

Test Dataset

BFO based optimization

Training of RBFNN using BFO

Termination Condition met

YES

NO

RBFNN

S_1

S_2

S_{t-1}

S_t

ϕ_1

ϕ_2

ϕ_u

Σ

$d(z)$

\pm

Network output

00:52

05:40

11:19 28-Aug-18

IMAGE LOAD OPEN:

ACH

The screenshot shows a VLC media player window titled "plantdisease.avi - VLC media player". The interface includes a menu bar (Media, Playback, Audio, Video, Subtitle, Tools, View, Help) and a main content area. On the left, there is a "Training Session" sidebar with buttons for "Load Image Folder", "Blast", "Feature Extract", and "Start Training". The main area displays a flowchart with nodes for "Normal plant leaf images", "Leaf image with diseases", "Training Dataset", and "Network output". A central "Open" file dialog box is overlaid, showing the "Documents" folder selected in the "Look In:" field. The dialog also shows a list of drives (Local Disk (D:), Local Disk (E:), DVD RW Drive (F:), CD Drive (G:), Removable Disk (H:)), a "File Name:" field, and a "Files of Type:" dropdown set to "All Files". A "Termination Condition met" decision diamond is visible below the dialog, with "YES" and "NO" paths. The Windows taskbar at the bottom shows the time as 6:59 PM on 7/20/2018. A red 'Y' mark is present at the bottom left of the screenshot.

FEATURE EXTRACT:

ACH

plantdisease.avi - VLC media player
Media Playback Audio Video Subtitle Tools View Help

Training Session

Load Image Folder

BrownSpot

Feature Extract

Start Training

```
graph TD; A[Normal plant leaf images] --> B[Image preprocessing]; C[Leaf image with diseases] --> B; B --> D[Feature extraction using Region growing method]; D --> E[Training Dataset]; E --> F[BFO based optimization]; E --> G[Training of RBFNN using BFO]; F --> G; G --> H{Termination Condition met}; H -- NO --> F; H -- YES --> I[RBFNN]; subgraph RBFNN; I --> J[S1, S2, ..., St-1, St]; J --> K[phi1, phi2, ..., phiu]; K --> L[Summation Sigma]; L --> M[d(z)]; M --> N[Network output]; end;
```

02:08 05:40

Type here to search

11:22 28-Aug-18

TEST HERE:

ACH

plantdisease.avi - VLC media player
Media Playback Audio Video Subtitle Tools View Help

Test Session

Load Image

Test Here

K-Means Cluster

Message

Detected Disease is = Brown Spot Matching==86.9792902989745%

Cluster Second

Cluster Third

Cluster Fourth

03:08 05:40

Type here to search

11:27 28-Aug-18

K-MEANS:

ACH

plantdisease.avi - VLC media player
Media Playback Audio Video Subtitle Tools View Help

Test Session

Load Image

Test Here

K-Means Cluster

Cluster Third

Cluster Fourth

Cluster Second

Message

- Cluster 1 and 4 gives Most damaged part of leaf and is = 56%
- Cluster Third gives Less damaged part of leaf and is = 0%
- Cluster second gives Non-damaged OR very Less damaged part of leaf and is = 42%

OK

03:18 05:40

Type here to search

11:28 28-Aug-18



CHANGE IMAGE:

ACH

plantdisease.avi - VLC media player
Media Playback Audio Video Subtitle Tools View Help

Test Session

Load Image

Test Here

K-Means Cluster

Selected Image

Cluster First

Cluster Second

Cluster Third

Cluster Fourth

05:07 05:40

Type here to search

11:31 28-Aug-18

Conclusion

- The plant serves as the basic need for any living organisms. They are the most important and integral part of our surroundings.
- Just like a human or other living organism does plant do suffer from different kind of diseases. Such diseases are harmful to plant in a number of ways like can affect the growth of the plant, flowers, fruits, and leaves etc. due to which a plant may even die. So in this work, we have proposed a novel method named as Bacterial foraging optimization based Radial Basis Function Neural Network (BRBFNN) for identification and classification of plant leaf diseases.
- The results, when compared with other methods, show that the proposed method achieves higher performance both in terms of identification and classification of plant leaf diseases.