EMOTION RECOGNITION FROM SPEECH SIGNALS ENHANCING HUMAN-COMPUTER INTERACTION WITH DATA SCIENCE

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ABSTRACT

This project presents a machine learning–based system for the analysis and identification of health conditions and diseases in medicinal and aromatic plants. The system uses image processing and supervised learning techniques to detect plant diseases from leaf images at an early stage. High-quality plant leaf images are collected and preprocessed to remove noise, normalize size, and enhance features. Machine learning models such as Convolutional Neural Networks (CNN) are trained to classify healthy and diseased leaves accurately. The system identifies common plant diseases by analyzing visual symptoms like spots, discoloration, texture variation, and shape deformation. This automated approach helps farmers, herbal cultivators, and agricultural researchers reduce crop loss, improve plant health monitoring, and promote sustainable cultivation of medicinal and aromatic plants. The proposed system is cost-effective, scalable, and capable of providing real-time disease detection with high accuracy.

KEYWORDS

Medicinal Plants, Aromatic Plants, Plant Disease Detection, Machine Learning, Image Processing, CNN, Leaf Image Analysis, Plant Health Monitoring

INTRODUCTION

Medicinal and aromatic plants play a vital role in healthcare, pharmaceuticals, cosmetics, and traditional medicine systems such as Ayurveda and Unani. The quality and yield of these plants highly depend on their health condition. Plant diseases caused by fungi, bacteria, viruses, and environmental stress significantly affect plant growth and medicinal value. Traditional disease identification methods rely on manual inspection by experts, which is time-consuming, subjective, and not feasible for large-scale cultivation.

With the rapid advancement of machine learning and computer vision, automated plant disease detection systems have gained attention. Image-based disease identification enables early diagnosis and timely intervention, reducing economic loss and improving productivity. This project focuses on analyzing leaf images of medicinal and aromatic plants using machine learning algorithms to classify healthy and diseased plants efficiently. The system provides a reliable, fast, and accurate solution for plant health assessment, making it suitable for modern agricultural practices.

LITERATURE SURVEY

Several studies have explored plant disease detection using image processing and machine learning techniques. Early research focused on traditional image segmentation and feature extraction methods such as color histograms, texture analysis, and edge detection combined with classifiers like SVM and KNN. While these approaches showed reasonable accuracy, they required manual feature selection and were sensitive to lighting conditions.Recent studies introduced deep learning techniques, particularly Convolutional Neural Networks (CNN), which automatically extract features and improve classification accuracy. Researchers have applied CNN models to identify diseases in crops such as tomato, potato, rice, and cotton. However, limited research specifically addresses medicinal and aromatic plants, which have unique leaf structures and disease patterns. The proposed system bridges this gap by applying machine learning models tailored to medicinal plant disease identification, offering improved accuracy and robustness.

RELATED WORK

Various machine learning–based approaches have been developed for plant disease detection. Traditional systems relied on handcrafted features and rule-based classification, which were less adaptable to complex disease patterns. Later, machine learning classifiers such as Random Forest, Decision Trees, and Support Vector Machines were used with improved performance.Deep learning approaches further enhanced disease detection by learning hierarchical features directly from images. Mobile-based and cloud-based plant disease detection systems have also been proposed to improve accessibility. However, many existing systems focus on food crops rather than medicinal and aromatic plants. The proposed work extends these techniques to medicinal plants, ensuring accurate identification and real-time analysis.

EXISTING SYSTEM

In existing systems, plant disease detection is mostly performed through manual observation by agricultural experts. Some digital approaches use basic image processing techniques combined with traditional classifiers. These systems require extensive preprocessing and manual feature extraction, making them complex and less scalable. Additionally, existing methods often lack real-time analysis and are limited to specific plant species. Environmental factors such as lighting and background noise also affect accuracy. As a result, existing systems are inefficient for large-scale and diverse medicinal plant cultivation.

PROPOSED SYSTEM

The proposed system uses machine learning and deep learning techniques to automate the analysis and identification of plant diseases. Leaf images of medicinal and aromatic plants are collected and preprocessed using image enhancement techniques. Features are automatically extracted using a Convolutional Neural Network (CNN), eliminating the need for manual feature selection. The trained model classifies leaves into healthy or diseased categories and further identifies the specific disease. The system supports real-time analysis and can be deployed as a web or mobile application for easy access. By leveraging machine learning, the system provides higher accuracy, faster detection, and improved scalability compared to traditional methods.

SYSTEMARCHITECTURE

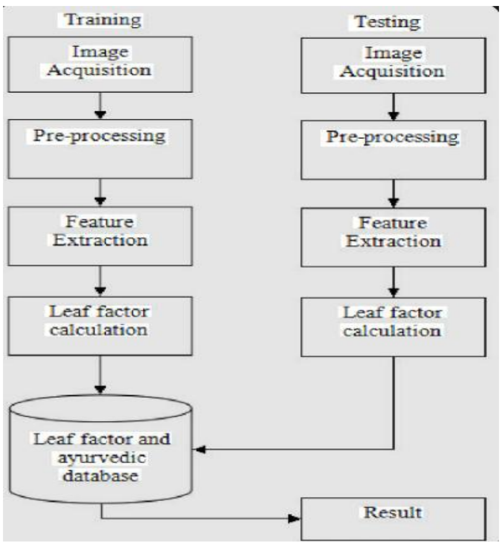

Figure.1: System Architecture

RESULTS AND DISCUSSION

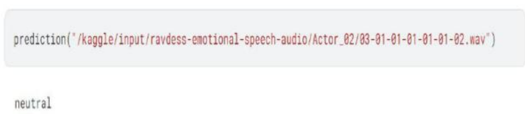

Figure.2: Neutral

After extracting audio features, the model analyzes the speech and predicts the emotion. The output **"neutral"** indicates that the speaker's voice shows no strong emotional expression.

```
prediction("/kaggle/input/ravdess-emotional-speech-audio/Actor_01/03-01-05-01-02-02-01.wav")
```

```
angry
```

Figure.3: Angry

After extracting speech features, the model analyzes the voice characteristics.
The output **"angry"** indicates that the speaker's tone reflects anger in the given audio sample.

```
prediction("/kaggle/input/ravdess-emotional-speech-audio/Actor_21/03-01-04-02-02-02-21.wav")
```

```
sad
```

Figure.4: Angry

The model extracts speech features and evaluates the emotional characteristics of the voice. The output **"sad"** indicates that the speaker's speech expresses sadness in the given audio sample.

```
prediction("/kaggle/input/ravdess-emotional-speech-audio/Actor_02/03-01-06-01-02-02-02.wav")
```

```
fear
```

Figure.5: Fear

The audio file is provided as input to a trained speech emotion recognition model. The model analyzes vocal features such as pitch, tone, and intensity to determine the emotion. In this case, the predicted emotion for the given audio sample is **fear**.

```
prediction("/kaggle/input/ravdess-emotional-speech-audio/Actor_01/03-01-08-01-01-01-01.wav")
```

```
surprise
```

Figure.6: Surprise

The model extracts relevant speech features and analyzes the emotional characteristics of the voice. The output **"surprise"** indicates that the speaker's speech expresses surprise in the given audio sample.

```
prediction("/kaggle/input/ravdess-emotional-speech-audio/Actor_01/03-01-07-01-01-01-01.wav")
```

```
disgust
```

Figure.7: Disgust

The audio file is given as input to a trained speech emotion recognition model.
The model analyzes speech features such as pitch, tone, and energy to identify the expressed emotion. Here, the predicted emotion for the given audio sample is **disgust**.

CONCLUSION

The project successfully demonstrates an automated machine learning–based system for analyzing and identifying health and diseases in medicinal and aromatic plants. The system provides accurate, fast, and cost-effective disease detection, reducing dependency on manual inspection. By enabling early diagnosis, it helps improve plant health management and supports sustainable cultivation practices.

FUTURE SCOPE

The system can be enhanced by integrating mobile applications and cloud-based deployment for real-time field usage. Advanced deep learning models and larger datasets can further improve accuracy. Integration with IoT sensors for environmental monitoring and recommendation systems for disease treatment can make the platform more intelligent and farmer-friendly.

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