IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed journal / Refereed journal ⁜ Vol. 12, Issue 10, October 2023

DOI: 10.17148/IJARCCE.2023.121025

Grape leaf disease detection

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Abstract*:* Grape diseases are main factors causing serious grapes reduction. So it is urgent to develop an automatic identification method for grape leaf diseases. Deep learning techniques have recently achieved impressive successes in various computer vision problems, which inspires us to apply them to grape diseases identification task. In this paper, a united convolutional neural networks (CNNs) architecture based on an integrated method is proposed. The proposed CNNs architecture, i.e., UnitedModel is designed to distinguish leaves with common grape diseases i.e., black rot, esca and isariopsis leaf spot from healthy leaves. The combination of multiple CNNs enables the proposed UnitedModel to extract complementary discriminative features. Thus the representative ability of UnitedModel has been enhanced. The UnitedModel has been evaluated on the hold-out PlantVillage dataset and has been compared with several state-of-the-art CNN models. The experimental results have shown that UnitedModel achieves the best performance on various evaluation metrics.

Keywords: leaf disease, deep learning, feature extraction.

I.INTRODUCTION

Grape leaf disease detection plays a crucial role in maintaining the health and productivity of grapevines, which are important for wine production and agriculture. Grape leaves can be affected by various diseases caused by pathogens, pests, or environmental factors. Early detection of these diseases is essential to prevent their spread, minimize crop losses, and apply targeted treatments. The traditional method of grape leaf disease detection relies on visual inspection by trained experts, which can be time-consuming, subjective, and prone to human error. However, advancements in technology, particularly in the field of computer vision and machine learning, have opened up opportunities to develop automated systems for grape leaf disease detection.

Economic Impact: Grape production is a significant agricultural industry worldwide. Grape diseases can lead to reduced crop yields and, in some cases, complete crop loss. Detecting and managing diseases is crucial for maintaining the economic viability of vineyards.

Disease Management: Early detection of grape leaf diseases is essential for effective disease management. By identifying diseases promptly, vineyard owners can take preventive measures to mitigate the impact and reduce the need for chemical treatments

II.LITERATURE SURVEY

1.Paper Name:Automatic grape leaf diseases identification via UnitedModel based on multiple convolutional neural Networks
Author:Miaomiao Ji a , Lei Zhang b , Qiufeng Wu

2.Paper Name: Grape Leaf Disease Detection and Classification Using Machine Learning
Author:Zhaohua Huang, Ally Qin, Jingshu Lu, Aparna

3.Paper Name: SVM Classifier Based Grape Leaf Disease Detection
Author:Pranjali B. Padol

4.Paper Name:Black Rot Disease Detection in Grape Plant (Vitis vinifera) Using Colour Based Segmentation Machine Learning
Author:Kirti

5.Paper Name:Apple and Grape Leaf Diseases Classification using Transfer Learning via Fine-tuned Classifier

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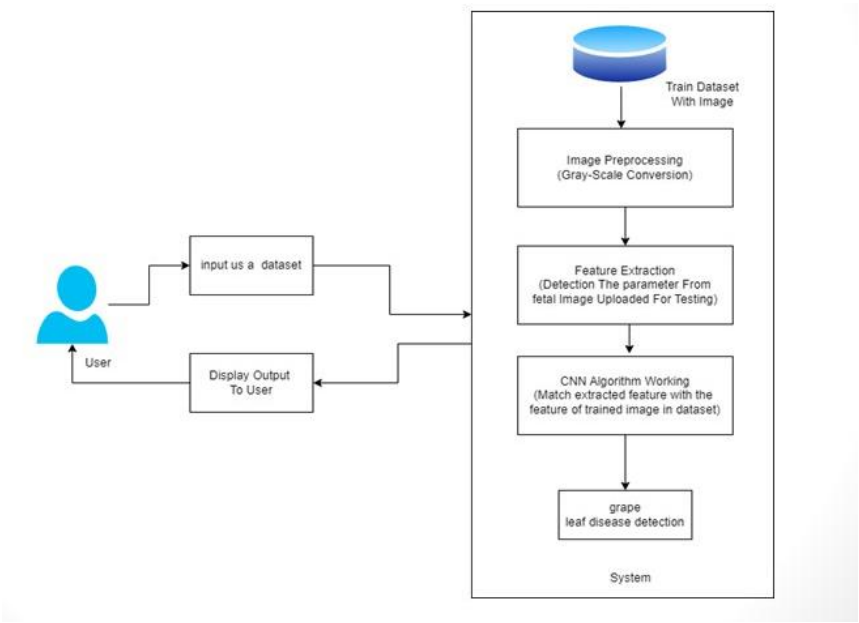
III.AIM & OBJECTIVES

1. Early Detection: Identify grape leaf diseases at an early stage.
2. Accuracy: Accurately categorize and diagnose disease.
3. Automation: Develop automated system for efficient detection.
4. Data Collection : Gather data for training and testing models.
5. Sustainability: Promote eco-friendly and sustainable vineyard practices.
6. Crop health: Monitor grapevine health and maximize crop yields.

IV.SYSTEM ARCHITECTURE



V.APPLICATIONS

The application of a Grape Leaf Disease Detection System can be beneficial in various ways for vineyard management and agriculture as a whole. Here are some key applications:

1. Early Disease Detection:

- The system can identify diseases in grape leaves at an early stage, allowing growers to take prompt action before the diseases spread throughout the vineyard.

2. Precision Agriculture:

- By precisely identifying and mapping diseased areas within the vineyard, growers can implement targeted treatments, such as applying pesticides or fungicides only where needed. This reduces the overall use of chemicals and minimizes environmental impact.

3. Crop Yield Optimization:

- Timely detection and treatment of diseases contribute to better crop health and, consequently, higher yields. Growers can optimize their grape production by addressing diseases early and efficiently.

VI.FUNCTIONAL & NON-FUNCTIONALREQUIREMENTS

A Grape Leaf Disease Detection System involves both functional and non-functional requirements to ensure its effectiveness, usability, and performance. Here are examples of functional and non-functional requirements for such a system:

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Functional Requirements:

1. Image Acquisition:
- The system should be able to capture high-resolution images of grape leaves using a suitable imaging device (e.g., cameras or smartphones).
- It should support both manual and automated image acquisition processes.

2. Image Preprocessing:
- The system should preprocess images to enhance quality and reduce noise.
- Features like resizing, normalization, and color correction should be included.

3. Disease Identification:
- Implement image analysis algorithms to identify and classify diseases on grape leaves.
- The system should be able to recognize multiple types of diseases commonly affecting grape leaves.

4. User Interface:
- Provide an intuitive user interface for users to interact with the system.
- Include features for uploading images, initiating the disease detection process, and viewing results.

5. Disease Severity Assessment:
- The system should provide an assessment of the severity of the identified diseases on the grape leaves.
- It should categorize the severity level as mild, moderate, or severe.

Non-functional Requirements:

1. Performance:
- The system should provide timely and accurate results within a reasonable processing time.
- It should handle a specified number of image uploads simultaneously.

2. Scalability:
- Design the system to handle an increasing number of users and a growing database of images.
- Ensure that performance remains consistent as the user base expands.

3. Reliability:
- The system should be reliable and available for use during critical times, such as the growing season.
- Implement backup and recovery mechanisms to prevent data loss.

4. Security:
- Ensure that user data, especially images, is securely stored and transmitted.
- Implement user authentication and authorization mechanisms to control access to sensitive information.

VII.SYSTEM REQUIREMENTS

Hardware Requirements:

- AMD/Intel i3 Processor or above Processor
- 8GB RAM or above RAM
- 40 GB or above Hard Disk
- Graphics Card: Intel HD620 or above
- A mobile device or Desktop
- Keyboard: Standard windows keyboaard

Software Requirements:
- Windows 10
- python
- Anaconda Navigator

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VIII.CONCLUSION

In conclusion, automated grape leaf disease detection systems offer numerous advantages for the viticulture industry. These systems improve efficiency by rapidly analyzing large volumes of grape leaf images, saving time and effort compared to manual inspection. They provide increased accuracy and consistency in disease detection, enabling the identification of subtle disease symptoms and patterns that may be missed by human observers. One of the key advantages is the early detection of grape leaf diseases, which allows for prompt intervention and targeted treatments. By identifying diseases at their early stages, these systems help prevent the spread of diseases and minimize crop losses. They also contribute to precision agriculture practices by providing real-time data on disease prevalence and severity, allowing for site-specific disease management strategies.

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