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Grape leaf disease detection using image processing and CNN

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Abstract: The primary causes of the significant decline in grape yield are grape diseases. Therefore, the development of an automatic grape leaf disease identification system is imperative. The remarkable results that deep learning techniques have lately obtained in a variety of computer vision challenges motivate us to apply them to the issue of identifying grape illnesses. This paper proposes an integrated method-based architecture for convolutional neural networks (CNNs). The suggested CNN architecture, or UnitedModel, is made to differentiate between healthy leaves and leaves that have common grape diseases including black rot, esca, and isariopsis leaf spot. The suggested UnitedModel can extract complementary discriminative features because it combines multiple CNNs. As a result, UnitedModel now has better representation. Using the withheld PlantVillage dataset, the UnitedModel has been assessed and contrasted with multiple cutting-edge CNN models. Based on multiple evaluation metrics, UnitedModel performs the best, according to the experimental results.

Keywords: Grape leaf disease, image processing, feature extraction.

I.INTRODUCTION

Finding grape leaf diseases is essential to keeping grapevines healthy and productive, which is critical for agriculture and wine production. Many illnesses that are brought on by infections, pests, or environmental conditions can harm grape leaves. In order to stop these diseases from spreading, reduce crop losses, and implement focused treatments, early detection is crucial. Detecting grape leaf disease through visual inspection by qualified professionals is the conventional approach, which can be laborious, subjective, and prone to human error. But technological developments, especially in the areas of machine learning and computer vision, have made it possible to create automated methods for the identification of grape leaf disease.

Economic Impact: Across the globe, the production of grapes is a major agricultural sector. Grape infections may result in lower crop yields or, in extreme circumstances, total crop loss. The economic sustainability of vineyards depends on the early detection and treatment of illnesses.

Effective disease management of grape leaf diseases depends on early detection of these conditions. Vineyard owners can lessen the impact of diseases and minimize the need for chemical treatments by detecting them early.

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

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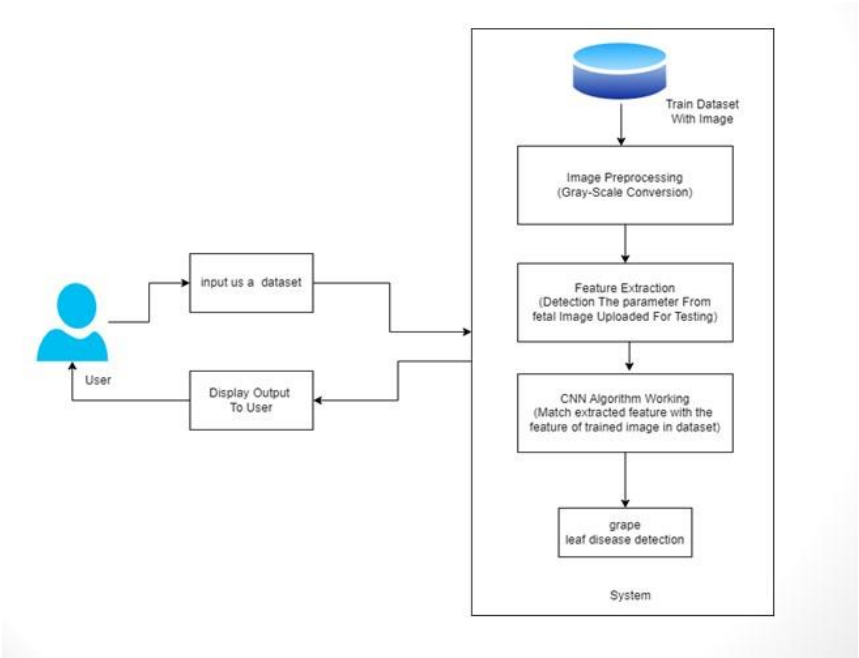
Author:Kirti

5.Paper Name:Apple and Grape Leaf Diseases Classification using Transfer Learning via Fine-tuned Classifier
Author:Nagaraju Y+, Venkatesh+

III.AIM & OBJECTIVES

1. Recognize illnesses of the grape leaf early on.
2. Correctly classify and identify illnesses.
3. Create an automated mechanism to detect things more effectively.
4. Compile information to be used in model testing and training.
5. Encourage environmentally responsible and sustainable vineyard operations.
6. Optimize crop production by keeping an eye on grapevine health.

IV.SYSTEM ARCHITECTURE



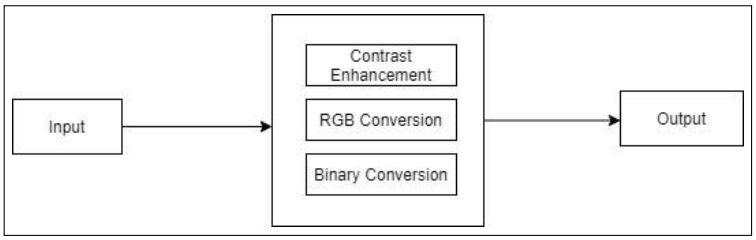


Figure 4.3: Data Flow diagram

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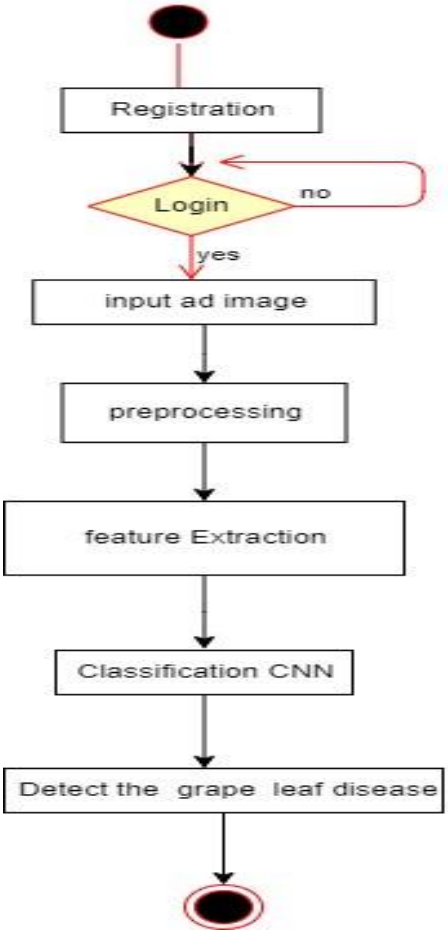

Fig. Activity Diagram

V.APPLICATIONS

Applying a Grape Leaf Disease Detection System has several advantages for managing vineyards and agriculture overall. The following are some important applications:

1. Growers can respond quickly to stop illnesses before they spread throughout the vineyard by using the technology to detect diseases in grape leaves at an early stage.

2. Growers can administer targeted treatments, including spraying pesticides or fungicides just where necessary, by precisely identifying and mapping unhealthy regions within the vineyard. This lessens the overall amount of chemicals used and its negative effects on the environment.

3. Early disease identification and management improve crop health and, as a result, increase yields. By effectively managing illnesses early on, growers may maximize their grape yield.

VI.LIBRARIES AND SERVICES USED

1. Python

Python is a general-purpose, interpreted, high-level programming language. Python was developed by Guido van Rossum and was originally made available in 1991. Its design philosophy places a strong emphasis on code readability and makes extensive use of whitespace. Its object-oriented methodology and language elements are designed to assist programmers in writing logical, understandable code for both small and large-scale projects. Python uses garbage collection and dynamic typing. It is compatible with various programming paradigms, such as object-oriented, functional, and structured (especially procedural).

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Because of its extensive standard library, Python is frequently referred to as a "batteries included" language. The ABC language was replaced with Python in the late 1980s. With the release of Python 2.0 in 2000, features like reference-counting garbage collection and list comprehensions were included. 2008 saw the release of Python 3.0, a significant language update that is not entirely backwards compatible and requires modifications in order to run most Python 2 code on Python 3.

2. ANACONDA NAVIGATOR

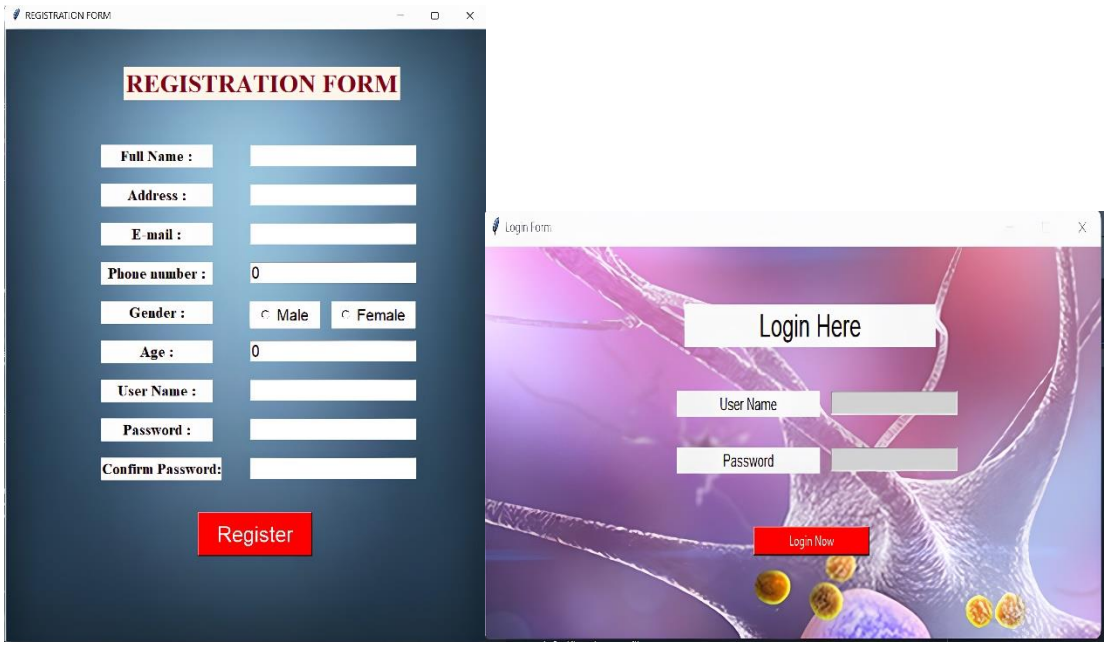
Anaconda Navigator With the goal of making package management and deployment easier, Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.). Data science packages compatible with Windows, Linux, and macOS are included in the distribution. Established in 2012 by Travis Oliphant and Peter Wang, Anaconda, Inc. is responsible for its development and upkeep. It is sometimes referred to as Anaconda Distribution or Anaconda Individual Edition since it is a product of Anaconda, Inc. Other products from the firm include the paid versions of Anaconda Team Edition and Anaconda Enterprise Edition. The package management system conda is in charge of managing package versions in Anaconda.

3. SQLite

SQLite is an open-source, lightweight relational database management system.Because of its straightforward, quick, and user-friendly architecture, it's perfect for apps that need a local database. Because SQLite is a serverless database, it doesn't need to execute on a different server process. Rather, the whole database is kept on the local disk as a single file. Because of this, it is very portable and simple to install and maintain. The missing person database, which contains information such as names, addresses, contact details, data about disappearances, photos, descriptions, and more, is managed by SQLite in the present system.

4. RESULTS

I.Login and Registration:



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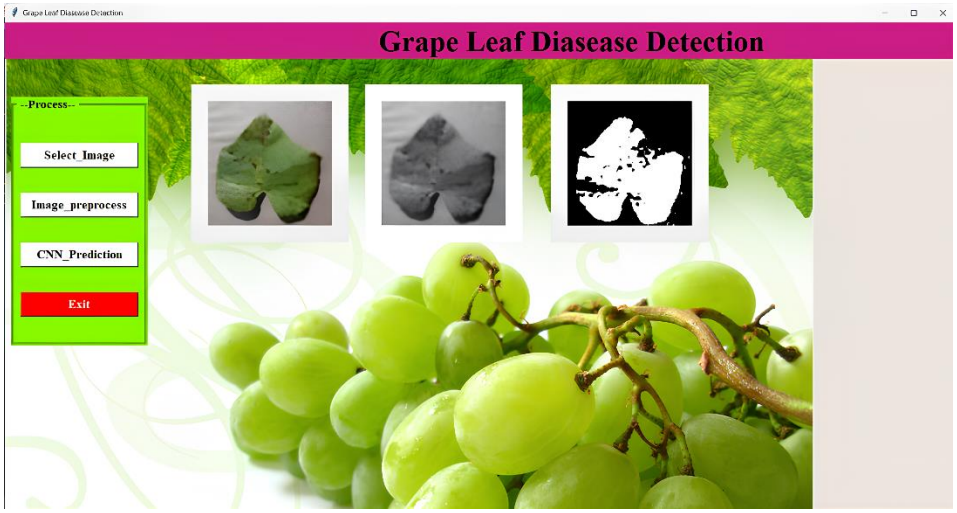
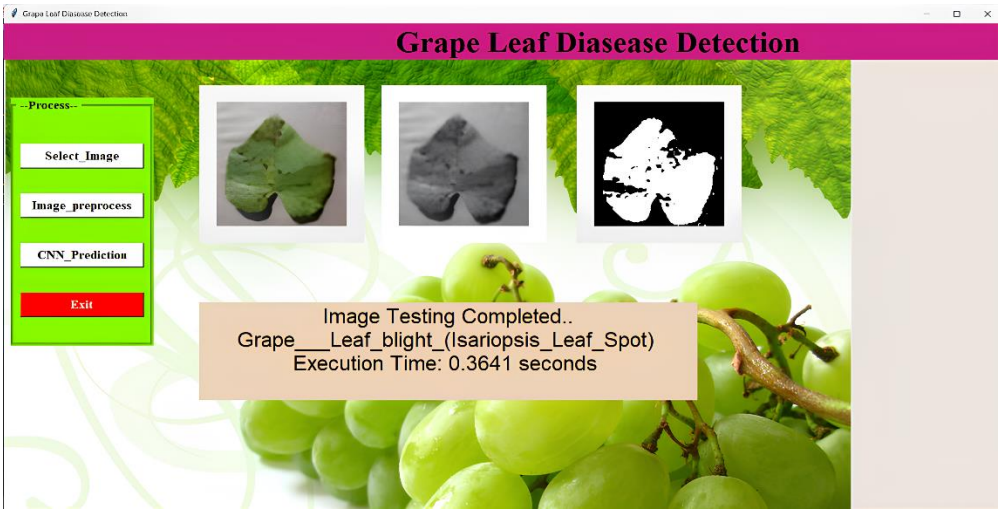
II.Image Selection:

I.Image Preprocessing:



II.CNN Prediction:



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5. 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

6. CONCLUSION

In conclusion, the viticulture sector can benefit greatly from automated grape leaf disease detection systems. When compared to manual inspection, these technologies save time and effort by quickly evaluating enormous volumes of photos of grape leaves, which increases efficiency. They offer improved consistency and accuracy in the diagnosis of diseases, making it possible to identify subtle illness patterns and symptoms that may go unnoticed by human observers. The early identification of grape leaf diseases, which enables timely intervention and focused therapies, is one of the main benefits. These devices reduce agricultural losses and aid in the prevention of disease spread by detecting illnesses early on. By offering real-time data on disease prevalence and severity, they also support precision agriculture methods by facilitating the development of site-specific disease control plans.

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