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Multiple Fruit Disease Detection Using Deep Learning

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Abstract:
Our proposed computer vision system uses multi-spectral imaging sensors to detect external defects in fruits. First, the proposed algorithm segments the fruit from captured Near-Infrared images. Red (NIR) and RGB images are created using only the NIR component. Next, adaptive pre-processing techniques are applied to segmented RGB and NIR fruit images. A thresholding technique is used to identify defects in seven different color components of the fruit. A voting process is used on the seven threshold color component images to determine if the fruit image is defective or not. Over the past year, service and package delivery companies have evolved. Online shopping offers numerous advantages for postal and courier businesses. The proposed system seeks to automate the process of identifying diseases in fruits, which is critical for maintaining food quality and crop yield. The system employs convolutional neural networks (CNNs) to analyse images of fruits and accurately classify them based on the presence or absence of disease. The CNN model is trained and evaluated using a dataset that includes images of both healthy and diseased fruits. The model's performance is evaluated in terms of accuracy, precision, recall, and F1 scores. The experimental results show that the proposed system is effective at accurately detecting fruit diseases, and it has potential applications in agriculture for early disease detection and precision farming.

1. INTRODUCTION

By providing food resources, the agriculture sector contributes significantly to the survival of humanity. However, climate change, pests, and diseases all present significant challenges to crop production and food security. Among these challenges, diseases affecting fruits can result in significant yield losses if not detected and treated promptly. Traditional disease detection methods frequently rely on manual inspections by agricultural experts, which can be time-consuming, subjective, and expensive. As a result, there is an increasing demand for automated systems that can accurately and efficiently detect diseases in fruits. Deep learning, a subfield of artificial intelligence (AI), has emerged as an effective tool for image analysis and pattern recognition. Convolutional neural networks (CNNs), a deep learning architecture, have demonstrated remarkable success. Artificial intelligence (AI)'s deep learning field, which specializes in training multi-layered neural networks, has transformed a number of fields, including pattern recognition and computer vision. When it comes to tasks like object recognition and medical imaging analysis, Convolutional Neural Networks (CNNs), a sort of deep learning architecture optimized for image analysis, have shown impressive performance. CNNs are a good choice for automated disease identification in agricultural environments because of these features. The suggested method for detecting

fruit diseases makes use of CNNs to precisely identify illness symptoms by analyzing digital photos of fruits. The algorithm may be trained to identify patterns suggestive of different diseases by using a wide dataset that includes photos of both healthy and diseased fruits.

2. PROBLEM DEFINITION

To develop a desktop application using deep Learning Currently available scalable and accurate fruit disease detection methods are insufficient to handle diseases in agricultural settings effectively. The labor-intensive, error-prone nature of manual inspection techniques limits their capacity to manage the growing complexity and diversity of fruit diseases. Due to this, there is a void in the agricultural sector, and farmers now need automated solutions that can accurately detect and categorize a variety of fruit diseases using digital images of their visible signs. Closing this gap is essential to increasing crop yields, cutting losses, and encouraging environmentally friendly farming methods.

3. OBJECTIVE

This project's central objective is to develop a secure and user-friendly application by using deep neural network for fruit disease detection.

1. Create a deep learning model that is optimized for the detection of fruit diseases using convolutional neural networks (CNNs).
2. Obtain and prepare a large collection of digital fruit photos with illness diagnoses to train and assess the deep learning model.
3. To increase the generalization and resilience of the model, implement data balance and image augmentation procedures.
4. To determine the deep learning model's efficacy in disease detection, analyze its performance using common measures like accuracy, precision, recall, and F1 score.
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6. Examine the system's scalability and practicality by putting it to the test on a variety of fruit species and disease situations that are frequently seen in agricultural settings.

The project aims to educate users about deep learning and its application in various day-to-day life applications.

4. LITERATURE REVIEW

Recently, there has been a growing number of research on deep learning methods for fruit disease detection. In this section, we focus ona review of the previous studies on steganography methods.

Dimitri A Lisin, Marwan A, Matthew w, B Blaschko presented an overview of combining local and global image features.

P Revathi , M Hemlatha provided classification of cotton leaf spot diseases using image processing edge detection techniques.

Nikitha M, Roopa Sri S, Uma Maheshwari B provided Fruit recognition and grade of disease detection using inception V3 Model.

5. SYSTEM DESIGN

A. System Architecture

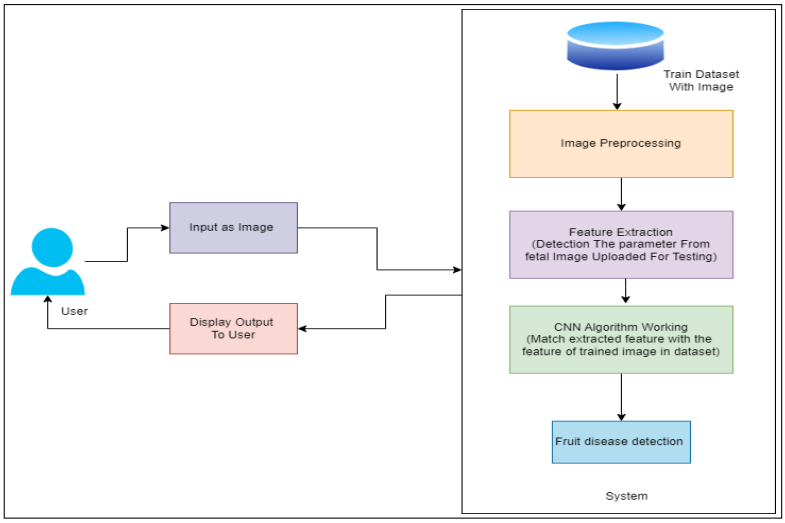


Figure 1

B. Data Flow Diagram

In Data Flow Diagram, we show that flow of data in our system. In DFD0, we display that base DFD in which rectangle present input and output and circle show our system. In DFD1, we show the actual input and output of the system. The input of our system is text or image, and the output is rumor identified. Similarly, in DFD2, we present the operation of both the user and the administrator.

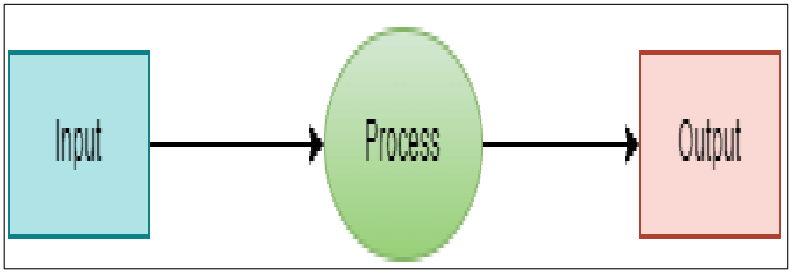
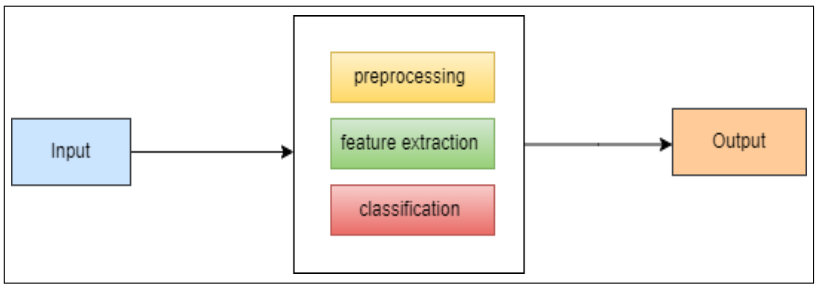
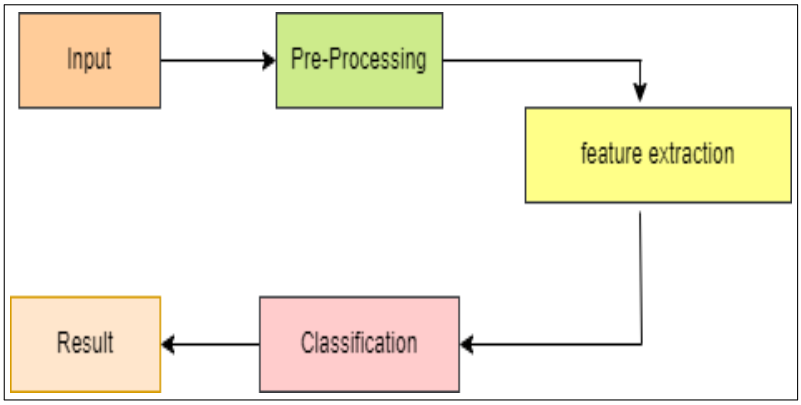


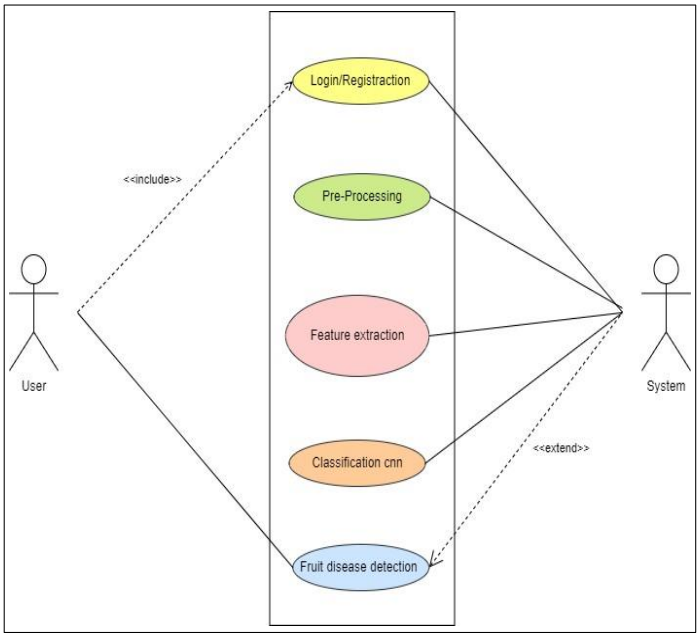
Figure 2. DFD I

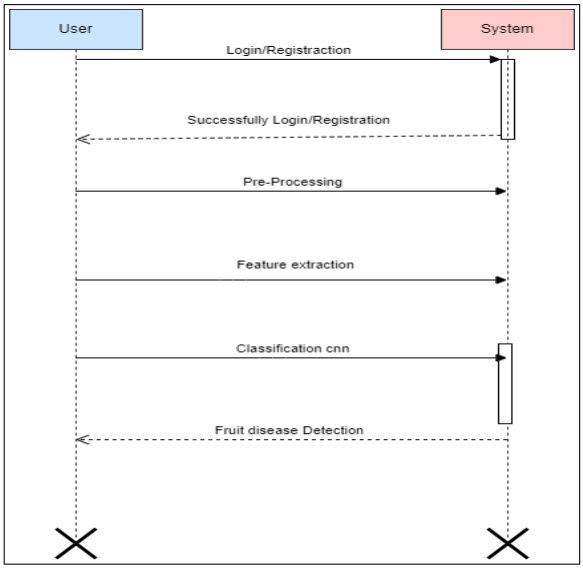


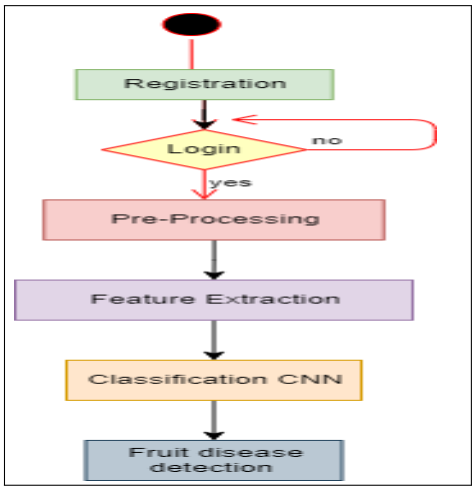


6 UML DIAGRAMS

The standard language for creating software blueprints is called Unified Modelling Language. A software-intensive system's artefacts can be visualized, specified, built, and documented using the UML.Although UML can be used in any process, it is best applied in use case-driven, architecture-centric, iterative, and incremental processes. The UML diagram's number is accessible.







CONCLUSION

This paper presents the method on different diseases classification technique used for fruit disease detection and an algorithm for image segmentation tech- Nique that can be used for automatic detection as well as classification of fruit diseases later.

- Advantage of using this method is that the fruit diseases can be identified at early stage or the initial stage. This method application of image processing diagnoses diseases.
- This image processing techniques helpful to extract the diseases part of the fruit and classify it. We should further research and implement the digital image processing for better detection of fruit diseases. This method useful for agriculture management and green house management

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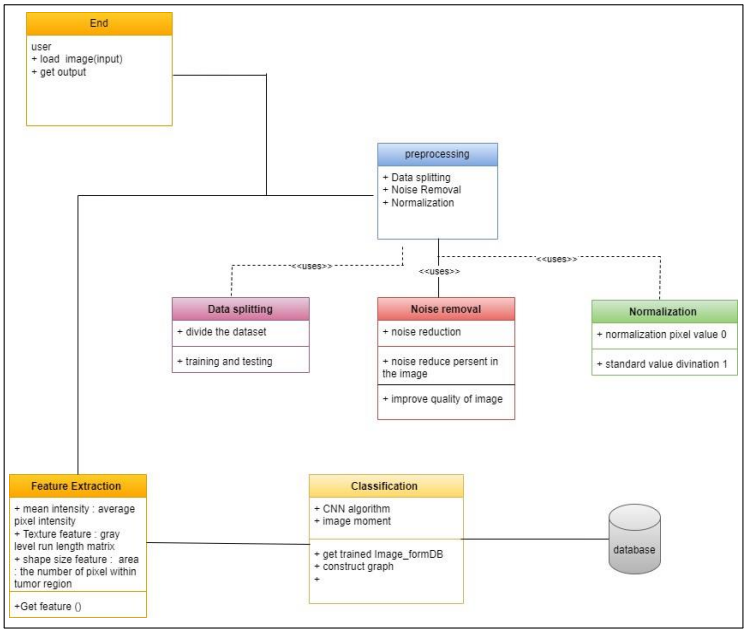

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