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AUTOMATIC FRUIT DETECTION USING MULTILAYER NEURAL NETWORK

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ABSTRACT:

Agriculture has become an important thing in everyday life .Among this, fruits are a great thing in everyday life. Classification of fruits based on their accuracy is a decent approach to all the fruit sellers. There is much parallelism between apple and cherry and various kinds of similarities are present in many types of fruits, so the classification plays an important role. However, there are troubles in fruit classification using machine learning algorithms like Support Vector Machine (SVM) and Convolution Neural Network (CNN). So, the methods of CNN, pooling layers and fully connected network have been applied to overcome the problems. The CNN and pooling layers have been applied to extract the features of the fruits.

Keywords: Agriculture, Convolution Neural Network, machine learning, Support Vector Machine.

INTRODUCTION

Food is a very important topic of discussion today, as improper handling and management of food during production, processing or distribution has caused increased food wastage around the globe. In addition, it has become clear from statistics gotten from surveys by institutions round the world like the Food Bureau of the United States that it is necessary to increase our rate of food production to meet the needs of our rapidly growing population. All of these, point to a growing need for optimization of the resources at our disposal and to help in efficient production and management of our food resources. Machine learning is a powerful tool that has been applied to many fields for the purpose of automation of basic operations and optimization of the results of these operations[1-2].

In [3], the authors gave provision for the use of publicly available fruit-in-orchard image data set to grant method comparisons and for the implementation of transfer learning of deep learning models.

In the paper [4], emphasis is placed on practical features for the application of deep learning models for fruit detection and localization, to the support of tree crop load estimation [5-8].

Figure 1 : Different Types of Fruit

Seeing as the visual assessment is the primary basis for a purchase choice in the market, ensuring the visual quality of fruits and vegetables is important to drive sales [9-10].

In this work, I would be developing a simple CNN to identify fruits in images. This system would help the human to reduce the time and effort needed for sorting of fruits at supermarkets. Thus, the proposed method helps to classify the fruits with higher accuracy. Fruit classification holds significant promise in revolutionizing the agricultural and food processing industries. By leveraging advanced deep learning techniques like Convolution Neural Networks (CNN), we aim to create a sophisticated and efficient fruit classification system. This system has the potential to transform the way we identify and sort fruits, bringing automation, accuracy, and speed to the process. The successful implementation of such a system can lead to improved crop management, reduced food wastage, and enhanced supply chain efficiency. Ultimately, our endeavor seeks to contribute to a more sustainable and technologically advanced future, benefiting farmers, consumers, and the overall food industry.

METHODOLOGY

The method which has been proposed for fruit detection classification is presented in Fig. 5. The method involves various phases such as Data Acquisition, Data pre-processing and classification.

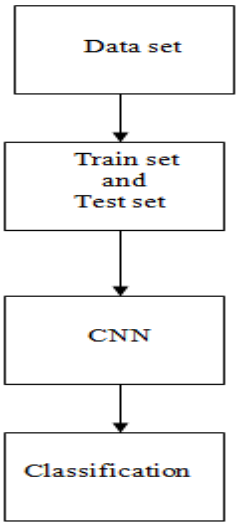

Figure 2: CNN Model for fruit Classification

RESULTS AND DISCUSSION

The fruit dataset theory refers to the conceptual framework and principles behind creating and using a dataset specifically designed for fruit classification tasks. In the context of deep learning and Convolution Neural Networks (CNN),

building an effective and representative fruit dataset is crucial for training a model that can accurately classify fruits based on their images. The number of sample images used for training and testing in each category is shown in Figure 3 and Figure 4 respectively

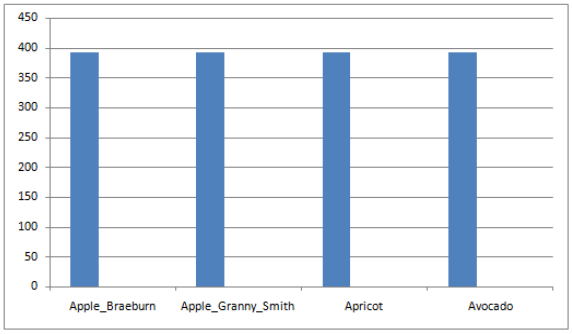

Figure 3: Data set used to Train the model.

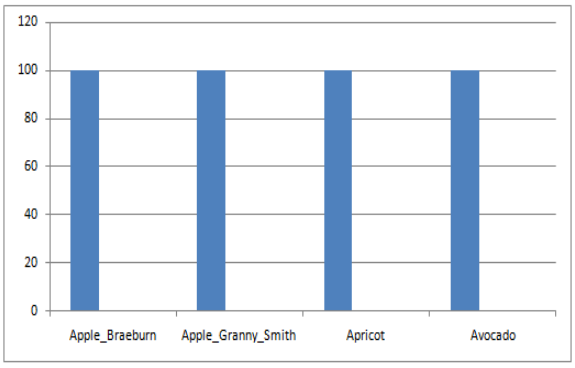

Figure 4: Data set used to Test the model.

Classification accuracy involves first using a classification model to make a prediction for each example in a test dataset.

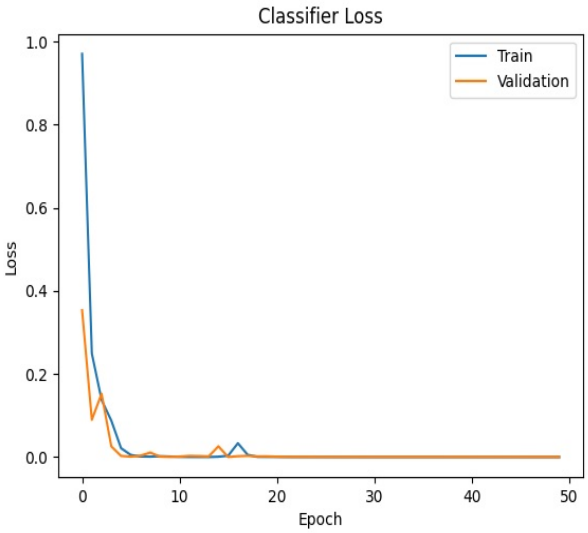

Figure 5: Loss Curve

The predictions are then compared to the known labels for those examples in the test set. Accuracy is then calculated as the proportion of examples in the test set that were predicted correctly, divided by all predictions that were made on the test set.

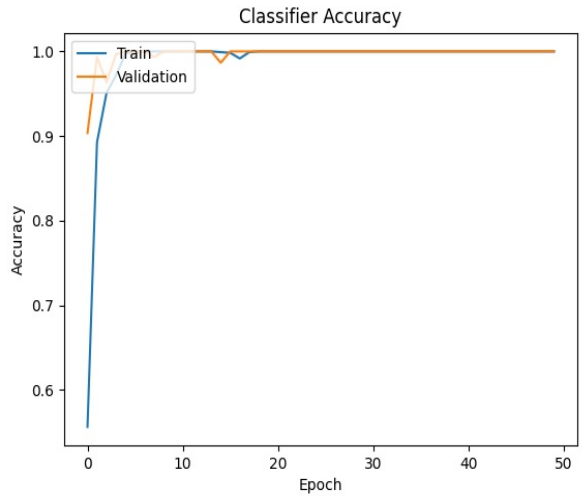

Figure 6: Accuracy Curve

Accuracy curve and a loss curve for the proposed CNN model has been presented as in Figure 5 and Figure 6 respectively. The proposed CNN-based approach shows promising results in accurately

classifying fruits, achieving a perfect accuracy of 100%, which indicates the model's robustness and effectiveness.

A confusion matrix is a matrix that summarizes the performance of a machine learning model on a set of test data. It is often used to measure the performance of classification models, which aim to predict a categorical label for each input instance. The matrix displays the number of true positives (TP), true negatives (TN), false positives (FP), and false negatives (FN) produced by the model on the test data. Confussion matrix obtained for the proposed model is as in figure 7.

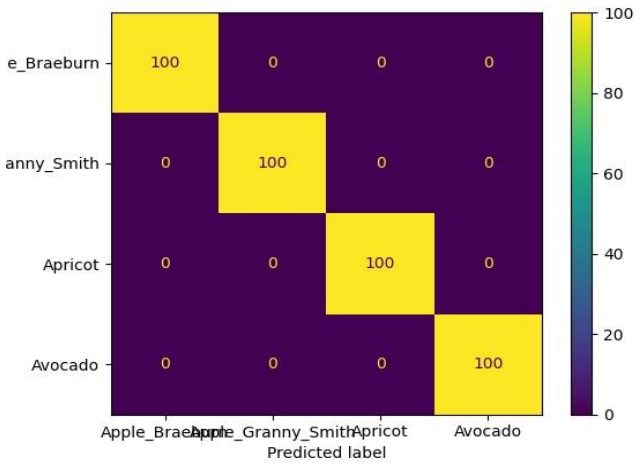

Figure 7: Confusion Matrix

CONCLUSION

The above model uses the CNN architecture for its feature extraction and classification between different diseases using folder name as labels. The model is able to efficiently detect different diseases with around 91 percent accuracy.CNN may be time and resource consuming although it gives consistent and precise results every time. The proposed system can be used as a proprietary diagnostic tool for the purpose of self-diagnosis or by general physicians

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