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Fruit Prediction using Convolutional Neural Network (CNN)

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***Abstract*—Agriculture now plays a significant role in daily life. Among these, fruits are fantastic in daily living. Classifying fruits according to their accuracy is a good strategy for all fruit vendors. The classification is crucial since there are many similarities between the apple and the cherry and across a wide range of fruit species. However, utilizing machine learning methods like Support Vector Machine (SVM) and Convolutional Neural Network, there are issues with fruit classification (CNN). In order to solve the issues, CNN, pooling layers, and fully connected networks have been used. The features of the fruits have been extracted using the CNN and pooling layers. Several fruits, including Apple, Blueberry, Cherry, Grape Blue, Guava, Kiwi, Lemon, Papaya, Strawberry, Plum, Tomato, and Mango are taken into consideration in order to expose this scheme. This project's implementation improves fruit classification's precision.**

***Index Terms*— Deep learning ,Fruit detection ,Convolutional Neural Network(CNN), agriculture.**

I. INTRODUCTION

Food is a hot problem in today's culture because of growing food waste due to incorrect handling and management of food during manufacturing, processing, or distribution. Additionally, it is evident from figures gleaned from surveys conducted by organizations around the world like the United States' Food Bureau that we must boost our rate of food production to satisfy the demands of our population's rapid population growth. All of these indicate a growing requirement for resource optimization in order to support effective food resource production and management. Machine learning is an effective technique that has been used in numerous fields to automate routine tasks and improve the outcomes of these tasks. As the primary factor in a consumer's decision to buy at the market, the aesthetic appeal of fruits and vegetables must be maintained in order to increase sales. In this thesis, I would create a straightforward CNN to recognize fruits in photos. By using this approach, a person might spend less time and effort sorting fruits at shops. As a result, the suggested method aids in more accurate fruit classification.

II. MOTIVATION

Academics have a tendency to simplify situations ,as seen by assumptions like a consistent with white background, as opposed to our comprehensive analysis that take into account various backgrounds. According to literature investigations, there has been no previous study attempt based on deep learning for a systematic method for fruit detection.

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III. LITERATURE SURVEY

ID	Publication Year	Name	Technique used
1	2023	Fruit detection using improved multiple feature based algorithm	Feature based algorithm
2	2022	Grape Yield Prediction using Deep Learning Regression Model	Grape Yield Prediction
3	2022	Fruit Freshness Detecting System Using Deep Learning and Raspberry PI	Fruit Freshness Detecting System
4	2021	Automatic Fruit Detection System using Multilayer Deep Convolution Neural Network	Deep Learning
5	2021	**Measuring the Ripeness of Fruit with Hyperspectral Imaging and Deep Learning**	Deep learning
6	2021	**Fruit and vegetables quality evaluation using computer vision**	Feature based algorithm
7	2021	**A Comparative Study on Predicting Food Quality using Machine Learning Techniques**	**Machine Learning Techniques**
8	2020	Deep Learning based Prediction of Amount of Pesticides and Diseases in Fruits	Deep Learning
9	2020	**Classification of Fruits using Convolutional Neural Networks**	**CNN**
10	2020	**Fruit firmness prediction using multiple linear regression**	**Multiple linear regression**
11	2020	**Fruit Recognition and Classification with Deep Learning Support on Embedded System (fruit net)**	**Fruit Classification**
12	2017	Detection and identification of coloured fruit and vegetables using Otsu type algorithm	**Otsu type algorithm**
13	2016	Fruit Recognition Based On Convolution Neural Network	**Convolution Neural Network**
14	2012	Classification of fruit using computer vision and a multiclass support vector machine	**Multiclass support vector machine**
15	2009	New Method to fruit recognition system	**Technique are developed based upon colour and shape**

IV. EXISTING SYSTEM

Introduction to the current system is a manual/machine system in which users must complete their tasks manually. It will take longer, and the entire operation is laborious and time-consuming.

A. Issues on Current System

It is restricted to a single operating system. There is a lot of manual labour involved (Manual work does not mean working with pen or paper, rather includes working on spread sheets and other simple software.)The current system is quite insecure.

V. BLOCK DIAGRAM

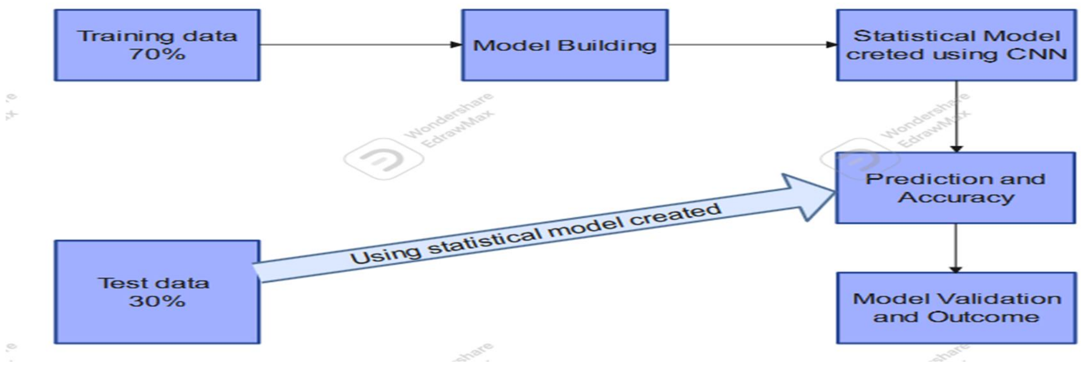

Fig 1. Block diagram

VI. REQUIREMENTS OF SOFTWARE

Windows 7 and higher are supported.
Python is a programming language.
Pycharm IDE: Sublimetext3

VII. REQUIREMENTS OF HARDWRE

System requirements: Intel I3 processor or above. Hard drive capacity: 200 GB.15-inch VGA color monitor.4 gigabytes of RAM ANDROID .

VIII. LIMITATIONS

Keeping track of phone bookings and cancellations is challenging. Does not provide worldwide assistance. The user is unable to make a reservation from a remote location. Information retrieval is complex and time-consuming. A significant amount of time and manual labour is necessary. It is restricted to a single operating system. There is a lot of manual labour involved (Manual work does not mean working with pen or paper, rather includes working on spread sheets and other simple software.)The current system is extremely insecure. It is unable to generate various types of reports.

IX. ALGORITHM

Two convolutional layers are stacked one on top of the other in the network, followed by two pooling layers and two fully connected layers. Figure 1 depicts the input layer of the network.
As input data, 30,000 neurons are employed to represent the usual RGB image, which is 100x100 pixels in size. The initial tip is The first convolutional layer has 64 filters with a Rectified Linear Units (ReLU) activation scheme and a kernel of 33 pixels. The second convolutional layer, which comprises 64 filters and the kernel, is known as the convolutional layer two. The same 33-pixel size and ReLU were employed as on the first. The convolutional layer The convolutional layer is used for this. features from input data extracted In addition, a filter and the layer before it are combined to create a small limited convolution process.
The kernel size affects where the filters are placed. the kernel's initializer The term Lecun uniform is used to every hidden layer. for establishing the weights One type of activator is ReLU. Function to enhance performance at the end of the day convolutional layers and fully linked layers Max pooling is used for pooling with layers 1 and 2 of the pool size. a speed of 22 and a stride length of 2 The padding that was used The fact that the padding is the same shows that the input and output feature maps' spatial dimensions are identical. The overfitting of the output and control's spatial dimension is decreased by pooling layers. The stride controls how the convolution occurs. The process involves the use of a kernel. while using complex kernels and photos of growing size The regularization layer is followed by a dropout with a probability of 0.25. Layer 2 pooling reduces the amount of neurons in the layer during training, preventing overfitting and improving performance by fortifying the network. In this method, 25% of the lights are randomly switched out. The outcome is a loss for the network. Overfitting the training data has the effect of making something more general and less specialized.

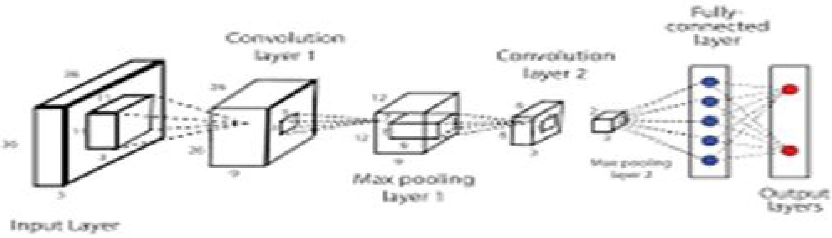

Figure 2. Convolutional Neural Network

X. Conclusions

This research proposes a convolution neural network-based approach for fruit recognition. The recognition rate has significantly increased. And when comparing the two approaches, using CNN alone has a lower recognition rate than CNN combined with a selective search algorithm. Although this method has a high recognition rate, it uses fewer fruit species in the experiment and does not take the changing external environment or other variables, such as light, into account. In subsequent work, we'll expand the fruit database's species and concentrate on fruit localization and detection.

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