International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 06 | June - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Disease Grading System for Fruits

Preeti Pawar,
Department of Electronics and Telecommunications
JSPM's Rajarshi Shahu College of Engineering, Pune, India

Joshna Dhanokar,
Department of Electronics and Telecommunications
JSPM's Rajarshi Shahu College of Engineering, Pune, India

Mahesh Bhadane,
Department of Electronics and Telecommunications
JSPM's Rajarshi Shahu College of Engineering, Pune, India

Dr. S. A. Paithane
Professor
Department of Electronics and Telecommunication
JSPM's Rajarshi Shahu College of Engineering, Pune, India

Abstract - This study demonstrates a method for detecting and grading fruit illness (accuracy). The main causes of agricultural loss are diseases in fruits and plants. This project aims to create a user-friendly tool that can detect the severity of a condition and provide a grade to it. For classification, the Inception model employs convolution neural networks, which are then retrained using the transfer learning technique. Various algorithms are used to identify and classify illnesses that affect crops. Our effort focuses on collecting an analysis of various fruit disease detection techniques as well as providing an overview of these strategies. Agriculture and farmers will benefit from research on disease detection and fruit grading. By determining the type of disease present in fruits and evaluating them according to their quality. Different properties of fruit were required for illness detection, and the classifier identified these features. After segmenting the image for fruit grading, compute Fruit that has been infected and fruit that has not been infected, with grading based on the percentage of infection on the fruit.

***Key Words*:** Support Vector Machine (SVM), Computer Vision, Principal Component Analysis (PCA), Fruit Classification, Fruit Recognition, Convolutional Neural Network (CNN).

1.INTRODUCTION

India is a farming country, and its farmers grow a diverse range of fruit and vegetable crops. Crop cultivation can be enhanced with technology assistance. India is an agricultural country that produces 44.04 million tons of fruit annually, making it the world's second largest fruit producer. India accounts for 10% of global fruit production. Apple, banana, citrus, grape, mango, guava, papaya, and watermelon are among the fruits grown by Indian farmers. Around 20% of the country's development is attributed to the fruit business. For image classification and fruit identification, neural network algorithms are quite popular and useful. This task is done based on the fruit's color, size, and shape. Convolution neural networks algorithms are utilized to detect illnesses in fruits based on their size and color. This model uses a convolution neural network for picture classification and object recognition in terms of computer technology. Object detection in real-world digital photographs is difficult. Non-controlled acquisition situations present a number of challenges, including varying lighting conditions, subject positions, and cluttered scenes. Deep learning approaches, which take advantage of enormous amounts of training data to develop strong and well-generalizing classifiers, are generally used to solve these difficulties in state-of-the-art solutions. Fruit classification automation is a fascinating application of computer vision. Traditional techniques of fruit classification have frequently relied on manual activities based on visual ability, which are difficult, time-consuming, and inconsistent. The appearance of the fruit's external shape is the primary criterion for classification. Computer machine vision and image processing techniques have become increasingly valuable in the fruit sector in recent years, particularly for quality inspection and color, size, and form sorting applications. According to studies in this field, using machine vision systems to increase product quality while freeing workers from the tedious task of hand-sorting apples is a viable option. The various image processing approaches used for fruit categorization are discussed in this research.

2. OBJECTIVE

- The majority of existing research on fruit freshness or related concerns is conducted using classifications that differ from our technique, which uses regression to grade freshness.
- Academics have a tendency to simplify the situation, as seen by assumptions such as a constant white background, as opposed to our full analyses that include complex backgrounds.
- To the best of our knowledge, there is no previous study effort based on deep learning for a systematic method (a mix of several neural networks) for fruit freshness rating, as determined by literature studies.

3. LITERATURE SURVEY

Fruit Quality Inspection Using Image Processing: Image processing avoids the challenge of numerically processing or quantifying photographic data. For agricultural activities, a number of image processing applications have been developed. In order to input the photos, these applications require the use of camera-based hardware systems or color scanners. Image categorization can be seen in the classification of fruits and the identification of fruit diseases. For an automated fruit grading system,-image processing and machine learning are used. Based on the surface properties of the apple photos, ANN was used to categorize empire and golden delicious apples. At specific wavelengths, textural and histogram features are retrieved from the photos. Then, using two cases of two class classification and five class classification, photographs of apples with surface characteristics were used in classification applications. The correlation between the measured feature parameter and the quality factor determines the method's effectiveness. Image Segmentation with the K Mean Algorithm and the Graph-Based Algorithm: To create an over segmentation result, the technique first employs the k-means algorithm to partition the source image into regions based on Euclidean color distance in l*a*b*. The goal of this project is to provide a general method for successfully segmenting items in photos to aid in the detection of fruit defects. The number of color channels used in gray level-based k-means for image segmentation determines the dimension of feature vectors. For k-means clustering, the L*a*b* or CIELab color space is employed

4. METHODOLOGY

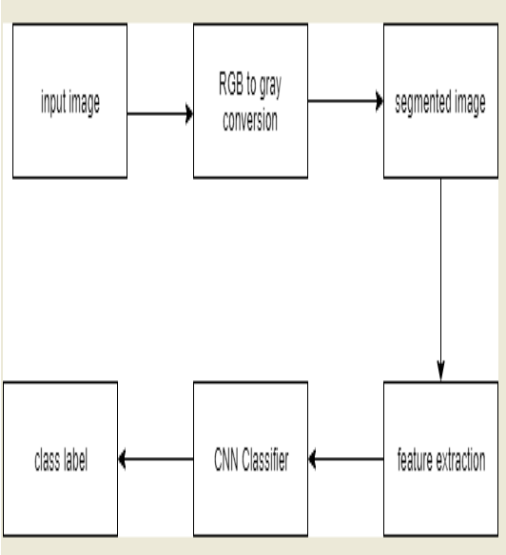


Fig-1: Image Processing for disease detection of fruits.

Image Acquisition- The acquisition of images is the first step in every vision system. After the image has been retrieved, this technique employs all elimination properties in order to enhance the number of features that can be extracted from the image. Through the camera lens, the image will be shown in three dimensions, with reflected light rays hitting the pixel sensor. Each pixel carries information such as light intensity and reflected light from the 3D sensor. The three-dimensional object is projected using two dimensions.

Filtering and pre-processing of images -This section removes noise, sharpens, and smoothens the image, as well as doing image scaling. RGB images are transformed to greyscale images, and the image contrast is boosted to a certain extent. Filtration is a term used to describe certain types of preprocessing processes.

Pre-processing- Pre-processing is often concerned with taking one array of pixels as input and producing another array of pixels as output that is better than the original array in some way. This pre-processing step may eliminate noise, improve image contrast, remove blurring caused by camera movement during image acquisition, and adjust for lens-induced geometrical distortions.

Segmentation of images- The term "segmentation" refers to the process of dividing an image into several segments. The purpose of picture segmentation is to make an image more meaningful and easier to examine by simplifying and/or changing its representation. The properties of discontinuity and similarity are used to categorize image segmentation algorithms. Boundary-based approaches are those that are based on

discontinuities, while region-based methods are those that are based on similarity.

Extraction of Characteristics -After segmentation, feature extraction is the next step in the fruit classification process. Color, size, shape, and texture are the most visible external features of fruit. A feature descriptor is a representation of an image or a portion of an image that extracts important information while discarding irrelevant data. It is mostly used for object detection and image recognition.

Classification- A type of supervised learning is classification. It is best used when the output has limited and discrete values because it identifies the class to which data elements belong. It can also predict a class for an input variable. The following are some of the important areas where classification cases are used:

• To determine whether an email is spam or a ham

• Determining customer segments

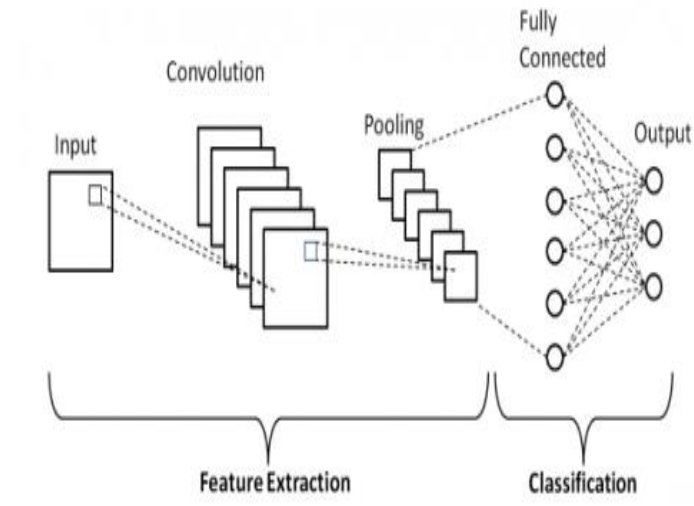
• Determine whether a bank loan is approved

• Determine whether a child will pass or fail an examination.

5. ALGORITHM

Convolutional Neural Network-

The input image is converted into a 3-dimensional array of pixel values, and then a convolution layer is applied to the image to get the basic features using feature map, and then max pooling is applied to the images to further reduce the dimension of the convolution layer. Finally, all of the pixel values are flattened and input as a neural network to learn features like shape, size, and color. Using the gradient decent approach, the neural network learns the retrieved features. The modal is capable of predicting the things supplied as input after learning.



Layer of convolution-

The findings are obtained from the output of this convolution layer, which computes a dot product at each sub area of the input data with its kernel. The size and number of kernels, as well as the layer's width and height parameters, are all parameterized, and non-linearity is used to activate functions.

Layer of maximum pooling-

It performs a down sampling procedure to minimize the feature size. It takes little chunks of input and produces a single output for each one. Following a convolution layer, this layer performs a down sampling operation to minimize the feature size. It only takes into account small rectangular blocks of data and produces a single result for each block. This can be accomplished in a variety of ways, but one thing is certain: it requires the most space in the block. As a result, if the block size is 2 2, the number of features is reduced by four times

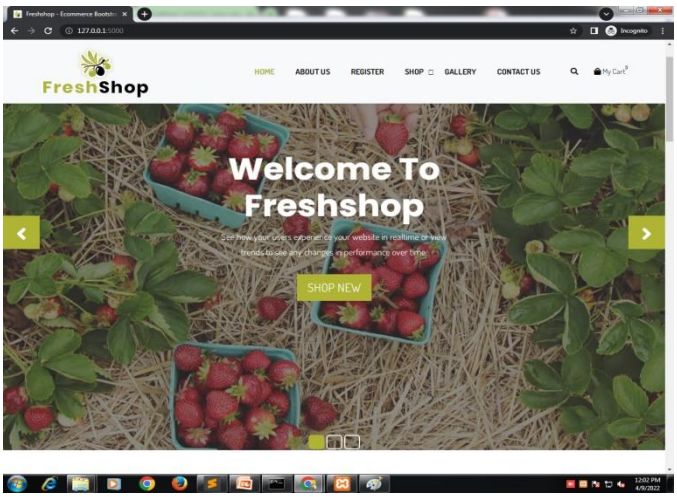
Layer of SoftMax

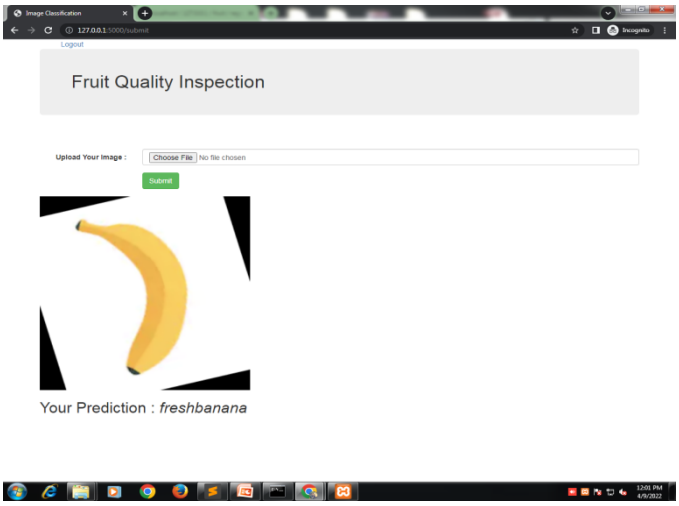
The SVM turns out to be one of two regularly used classifiers. The SoftMax classifier, which uses a different loss function, is another common option. The SoftMax classifier is a generalization of the binary Logistic Regression classifier to multiple classes if you've heard of it previously. Unlike the SVM classifier, which treats the outputs as (uncalibrated and potentially difficult to interpret) scores for each class, the SoftMax classifier produces a slightly more intuitive output (normalized class probabilities) and also has a probabilistic interpretation that we will discuss shortly. The function mapping remains unaltered in the SoftMax classifier, but these scores are now interpreted as unnormalized log probabilities for each class, and the hinge loss is replaced with a cross-entropy loss of the form.

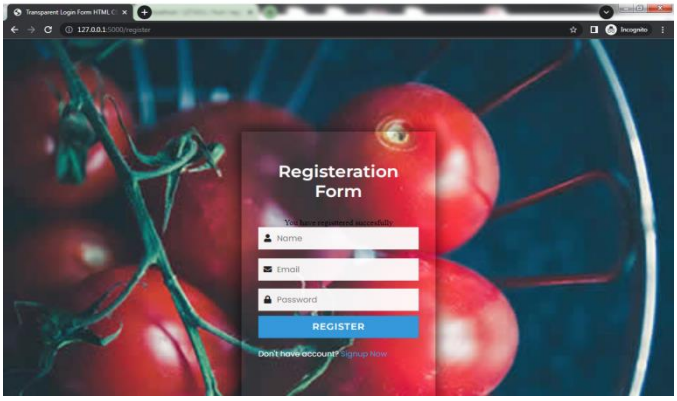
6. CONCLUSION

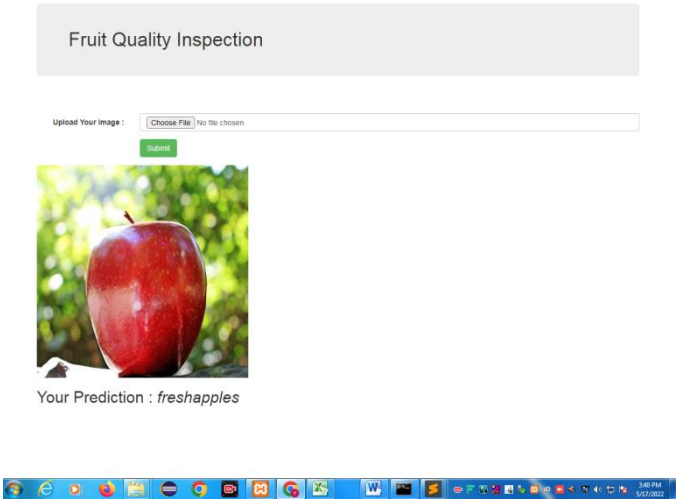
This research focuses on the application of convolutional neural networks (CNNs) in the food and agriculture industries. Size, color, and shape are the most essential quality criteria of agricultural products. CNN is extensively used to restore physical examination of food, and it provides us with true, unbiased, and constructive classification. In addition, we created our own experimental database. The suggested technique distinguished between ripe and rotten fruits. In order to improve the functionality and versatility of our dataset, we included various real-world challenges. As a result, the proposed technique effectively increases the rate of fruit recognition and freshness detection, allowing real-world application demands to be met.

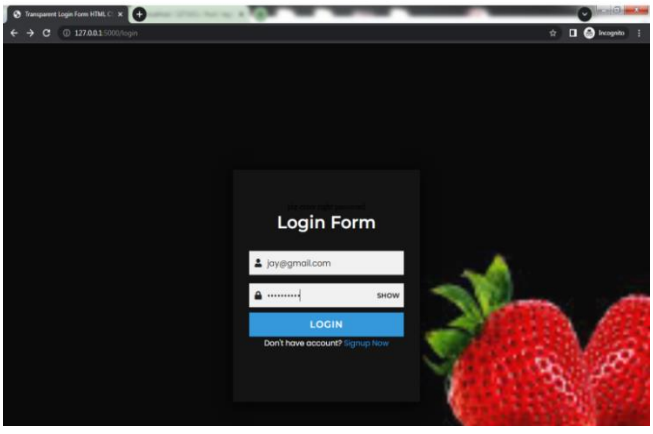
RESULT











REFERENCES

[1] Krithika Jayasankar, Karthika B, "Fruit freshness detection using raspberry pi" International Journal of Pure and Applied Mathematics, 1685-1691 ISSN: 1314-339, pp: 1685-1690, 2018.

[2] Mandeep Kaur, Reecha Sharma, "ANN based Technique for Vegetable Quality Detection, IOSR Journal of Electronics and Communication Engineering", ISSN: 2278- 8735, pp:62-70, 2015.

[3] S.M. Shirsath, Sumit S. Telang, "Fruit Quality Inspection using Image Processing", Journal of Springer,

ISSN:2395- 4396, pp:1355-1359, 2015. Kumar S. Krishna et al.; International Journal of Advance Research, Ideas and Innovations in Technology © 2020, www.IJARIIT.com All Rights Reserved Page |22 [4] Haisheng Gao, Fengmei Zhu and Jinxing Cai," A Review of Non-destructive Detection for Fruit Quality", Journal of Springer, IFIPAICT vol 317, pp:133-140, 2010.

[5] Rashmi Pandey, Sapan Naik, Roma Marfatia, "Image Processing and Machine Learning for Automated Fruit Grading System", International Journal of Computer Applications, ISSN:0975-8887, pp:29-39, 2013.

[6] Van Huy Phan, Byung Ryong Lee," An Image Segmentation Approach for Fruit Defect Detection Using K-Mean Clustering And Graph-Based Algorithm.", Journal of Springer, ISSN:2196-8896, pp:25-33, 2015.

[7] Baietto M, Wilson AD, "Electronic-Nose application for fruit identification and quality grading". Journal of Sensors, ISSN:1424-8220, pp:899-931, 2015.

[8] Ms Rupali S. Jadhav, S.S. Patil, "A Fruit Quality Management System based on Image Processing", The International Origination of Scientific Research Journals, ISSN: 2278-8735, pp: 01-05, 2013.

[9] Kedar Patil, Shriniwas Kadan, Suraj Kale "Machine Vision Based Autonomous Fruit Inspection And Sorting", International Research Journal of Engineering and Technology, ISSN:2395-0072, pp:413-417, 2013.

[10] Saifalt Tamakuwala, Jenish, "Quality Identification of Tomato Using Image Processing Techniques", International Journal of Electrical, Electronics and Data Communication (IJEEDC). ISSN:2320-2084, pp: 67-70, 2018.