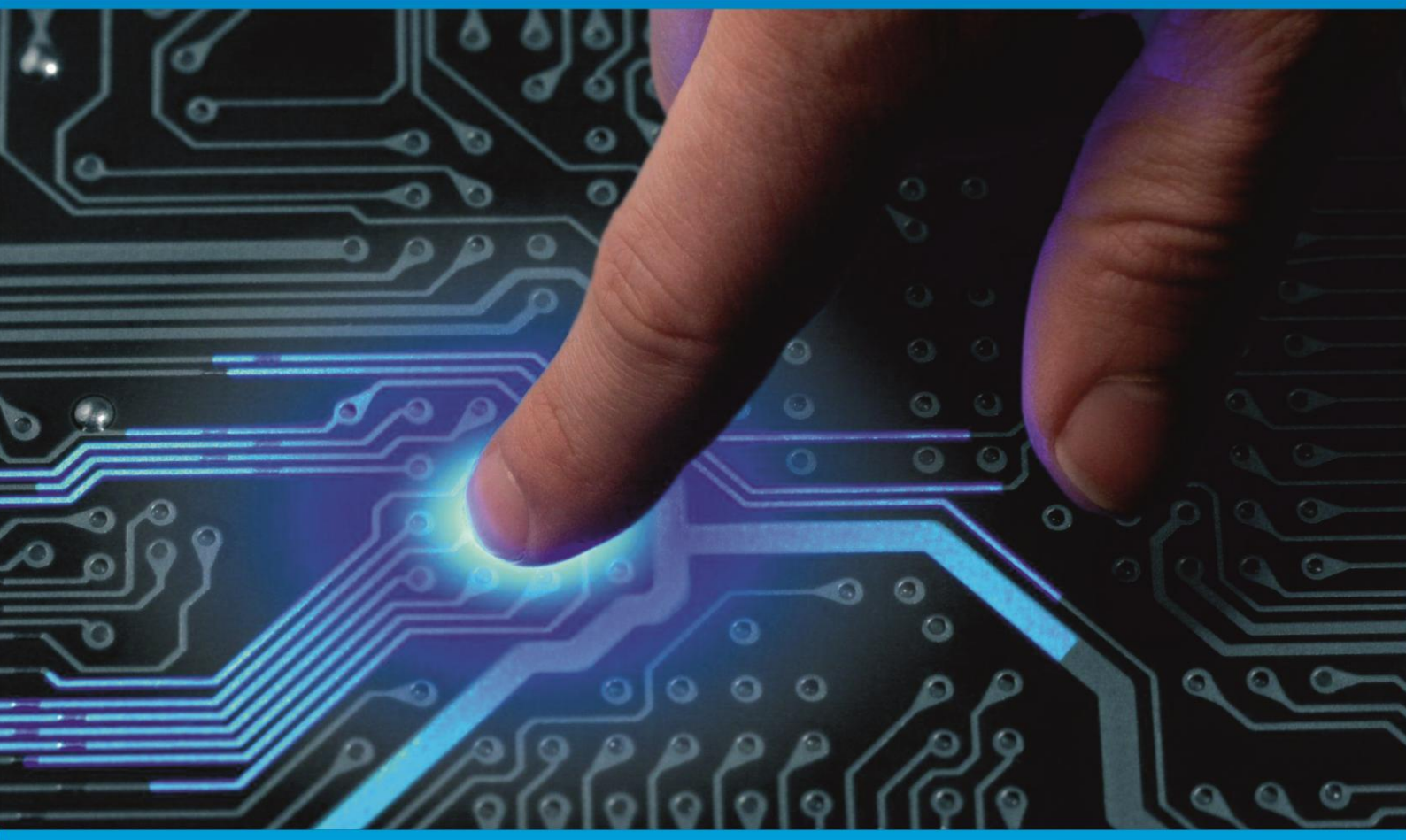
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 7, July 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

Web Based Application for Detection of Adulteration in Fruits using Machine Learning

Dr. Gunavathi H S,Sanjeev Kumar Mendegar, Shoaib Hussain, Siddeshwar, Syed Mutaib Ali

Department of Computer Science and Engineering, Bangalore Institute of Technology, Bengaluru, India

ABSTRACT: Fruits are essential for healthy life. The fruits we take should be pure, nutritious and free from any type of adulteration for proper maintenance of human health. Formalin is used as a preservative by the traders to improve the appearance of fruits and vegetables and to sustain for longer periods. Formalin is a colorless, aqueous solution of formaldehyde to preserve biological specimens. Not every case of adulteration will result in serious adverse health effects. But the chemical is highly toxic and a 30 ml of formalin containing 37 percent of formaldehyde can kill an adult. Many of the methods for detection of food adulteration require elaborate steps of sample preparation and prior analysis involving high-end technologies which makes the whole process difficult to perform and time consuming. Visual Geometry Group 16 (VGG16) architecture has been incorporated in our system to accurately predict the correct concentration of formalin. The main aim of this system is to replace the manual inspection system. This helps to speed up the process, improve accuracy and efficiency. This system captures the image of the fruit and then image processing is done to get required features of fruits such as color and size. Adulterated fruit

is detected based on image pixels. Sorting is done based on color and size.

KEYWORDS: Adulteration,VGG16,Formalin.

I. INTRODUCTION

Fruits are essential for healthy life. The fruits we take should be pure, nutrition sand free from any type of adulteration for proper maintenance of human health. The in take of any fruit substance is intended for the nourishment which is gained from it. Since the fruit is into consecutive stages of production, processing and finally distribution, the nourishment in the fruit items is collapsed. For the fruit products to ripen and improved in texture, storage and appearance, a concept of adulteration is widely practiced. The nature or quality of the fruit is reduced through addition of adulterants by the process of fruit adulteration. The adulterants is a foreign chemical substance present in fruit. In the process of fruit adulteration, little quantities of non-nutritious substances are added knowingly to improve its appearance or storage properties of the fruit. Mostly the adulteration in fruits and vegetables are caused using a harmful chemical substance called Formalin. Formalin is a colorless, aqueous solution of formaldehyde to preserve biological

specimens. India is at second number after china in the production of the fruits. In India all the preharvest and post-harvest process are done manually with help of labor. Manual process is very time consuming, less efficient so to get accurate result automation in agriculture industry is needed. The post-harvest process includes sorting and grading of fruits. Different quality factors are considered for sorting and grading of fruits. These factors are internal quality factors and external quality factors. The external quality factors are texture, shape, color, size and volume and internal quality factors are test, sweetness, flavor, aroma, nutrients, carbohydrates present in that fruit

II. RELATED WORK

Kawaljit kaur and Chetan Marhawa [1] studied the diseases present within fruits. Their analysis indicates that automated approach to disease detection within fruits consume mush less time as compared to manual approach. Noise can distort the image. So denoising mechanism are also elaborated in this case. Their work showed that blight is common disease which is infecting most of the fruit crops. In order to tackle such diseases image of distorted leaf was

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

taken and then fed into the system for analysis. Image processing techniques such as pre-processing, extraction, singular valued analysis etc was utilized in order to detect disease at early stage.

Shaikh Rakhshinda Nahid M.Ayyub and Aarti Manjramkar [2] proposed the method which classified the diseased and normal fruit images using three classes of apple disease Blotch, Rot, and Scab. Their experimental outcomes show that the given solution can significantly support automatic identification and classification of apple fruit diseases. Based on their experiments, the more precise outcome for classification of apple fruit disease has been achieved.

Md. Ashraf Kamal, Nafiza Nusrat, Nowrin Siddique Dola [3] designed and developed a detector that can sense the presence of formaldehyde in air which is measured in Parts Per Million (ppm). The prototype used a storage device

(SD)technology to save real time data and an android application so that the user can be sent message along with the location. The objective of their study was to design and develop a system that can detect formaldehyde concentration and indicate if the reading is be low or above the permissible level of formaldehyde. Anjana. M. P and Pradeepa. Kproposed the paper 'Detecting Food Adulterants using the concepts of Machine Learning'[4] which is based on the technology of digital image processing and open source computer vision, can definitely provide a permanent solution for the burning question of adulteration in fruits and vegetables with the help of enhanced researches, required data sets and experiments and relieve the consumers from the unnecessary intake of poisonous adulterants which will lead to many diseases and pre mature deaths. The precision of the results rendered by this model would be more accurate as it is developed with the latest technology 'opencv2' and modern tools and libraries like 'numpy, pyplot' Nikhitha M, Roopa Sri S and Uma Maheswari B [5] proposed a method to find how much percent the fruit is affected and recognize the fruit in the given image. To get better results in the classification and identification of fruit diseases Inception v3 model and Transfer Learning were used. They also add some more features to model so that the fusion of image processing and deep neural network was not only useful for the fruit disease detection but also useful for detecting diseases in vegetables and plants and it was completely helpful for the agricultural industry. Ramya, Dr.P.Kumar,

K.Sivanandam and M.Babykala [6] developed a cloud based scheme for helping Indian farmers and agriculture, which helps to analyze the agriculture data in a better way to reduce the hoardings and in bringing up a prosperous safe and peaceful farmer society in India. The classification and segmentation of fruit images were performed using K-Means Algorithm and SVM technique. The various features of few fruits were initially extracted and segment the respective images. After comparison with feature values, the various disease names are analysed and the optimal disease for the image was identified and the disease is indicated by an alert box and canbe provided as the message through mobile application. Jijesh J.J et.al. [7] Proposed a system that captures the fruit placed on conveyor belt, then the captured image is compared with the trained data set using Convolutional Neural Network Network(CNN) algorithm which extracts the features of the fruits like texture, color, and size. In the convolution layer of CNN edges from raw pixel data were detected further. These edges were used to detect shapes and then higher level features were

detected by shapes. This paper presented the sorting of apple fruit based on their quality such as Type A (best) Type B (raw or average) and Type C (worst) done by using CNN which is a deep learning algorithm. Miss. Supriya V. Patil [8] presented the Computer Vision based technology for fruit quality detection. In this paper the identification of normal and defective fruits based on quality using OPENCV/PYTHON was successfully done with accuracy. The use of image processing for identifying the quality can be applied not only to any particular fruit, but can also apply this method to identify quality of vegetables with more accuracy. Thus, this will enable the technology to be applied in many products. To replace manual inspection of food, computer vision system was used which provided authentic, equitable and non-destructive rating. Kanjana P Devi and Dr. Rathamani [9] showed the correlation Chart of Probability Ratio of Support Vector Machine (SVM) algorithm, Existing-K- Means neighbour algorithm, E-K-Means Clustering algorithm showed the various qualities. Number of information in x hub and the Probability Ratio in y hub. The E-K- Means Clustering algorithm was superior to the next two algorithms. Lisha Kamala.K and Dr. Sini Anna Alex [10] proposed the application which includes preprocessing to enhance the feature of the image, for image segmentation random forest algorithm was used and for feature extraction shape, color and texture was considered and for classifying disease in apple fruit SVM classifier was used. Hence the overall accuracy that obtained was 94.1%. S. Prince Sahaya Brighty, G. Shri Harini and N. Vishal [11] proposed a system for detection of food contamination

using arduino, which is one of the simple methods which produces result by measuring the resistance present in the food. Sensing raw formalin without a predefine model of naturally formed formalin result could be misleading. Hence this system traced the artificially added formalin as a preservative binary " machine learning algorithms i.e, Logistic regression, Support Vector Machine, K-NN Classifier were applied to the experimental dataset to build a predictive model.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

Conductive properties were used to detect the type of foods. The designed system was able to detect 1–50ppm (parts per million) of formalin using VOC HCHO gas sensor combining with RaspberryPi. This machine learning approach for formalin detection detected the formalin concentration in any food item and the consumption could be based on the safety status detected on the food items.

III.PROPOSED ALGORITHM

- **Dataset Collection:** The dataset is collected from CFS and manually from google images. The Datasets contains fresh as well as artificially added formalin fruits in it. Imagesofapple and orange are collected and used for training.
- **Data Preprocessing:** In this module first the image is resized and then it is converted from rgb to gray scale using ski-image method. Ski-image, is an open source Python package designed for image preprocessing
- **Feature Extraction:** In this module the features of fruit like texture and shape is usedtoidentify the fruit. Once the fruit is identified then the infected area of fruit is extracte dusing contour area method. The primary function here is to identify and outline the target object that is the apple or orange fruit for segmentation. It requires some prior knowledgeof the target object's shape, especially for complicated things. After identifying the shapeof the fruit then the counter is used to segment one portion of an image that has uniquecharacteristics when compared to other regions of the fruit image.
- **Building and training VGG16 Model:** The VGG16 network will be trainedontheprocessed dataset. VGG16 model is built using the layers provided in the keras library. TheVGG16 have a large number of hyper-parameter, they focus on having convolutional layers of 3x3 filter with a stride 1 and always use same padding and maxpool layer of 2x2filter of stride 2 and follows this arrangement of convolution and max pool layers consistent throughout the whole architecture.
- **Formalin Detection:** In this module the threshold value is calculated. Basedonthethreshold value the mask of image is detected and background separation and contour areamethod is applied once again to detect the patches and unhealthy area of fruit. The concentration of formalin is estimated.
- **Predict the Quality of fruit:** This module basically gives the status of the fruit totheuserand defines its quality based on formalin content and percentage of area effected. If theconcentration of formalin is low, then the fruit is healthy and it is consumable andif theconcentration of the formalin is high and the area of infection is above 50%then the fruit isnot consumable.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

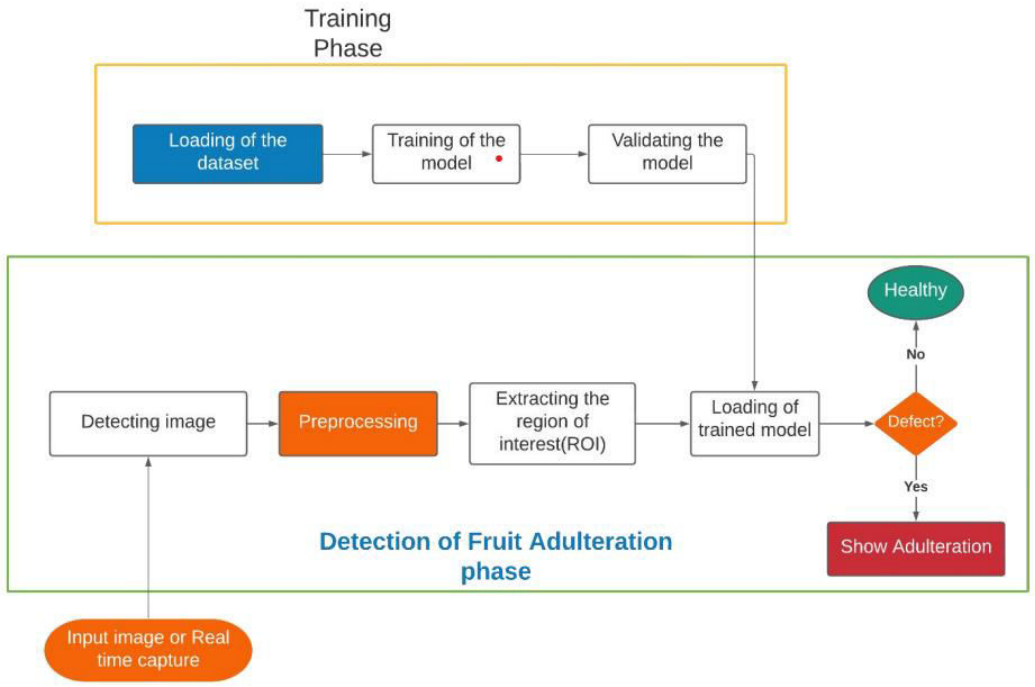


Fig.1: Block diagram of the proposed system

IV.PSEUDO CODE

Step 1: Apply Binary Thresholding

set threshold value,

lower=[60, 60, 60] higher=[250, 250, 250]

Step 2: Create the mask of input image.

Step 3: The background subtraction of input image.

background=mask_image-original_image

Step 4: Apply countourArea method and get the area of adulteration.

Step 5: Calculating the formalin percentage based on threshold level.

(number of adulterated pixels*100)/Total number of pixels.

Step 6: Display percentage of formalin

V.SIMULATION RESULTS

The A test report is an organized summary of testing objectives, activities, and results. Once our deep learning model is built (with your training data), we need unseen data to test our model. This data is called testing data, and we can use it to evaluate the performance and progress of our algorithms' training and adjust or optimize it for improved results. Finally, the test data set is a data set used to provide an unbiased evaluation of a final model fit on the training data set. If the data in the test data set has never been used in training, the test data set is also called a holdout data set.

Data created or selected to satisfy the execution preconditions and inputs to execute one or more test cases. Below, are some of the test reports provides a finalcheck of an dataset to confirm that the system was trained effectively.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

Fig 2: Fruit image selection UI

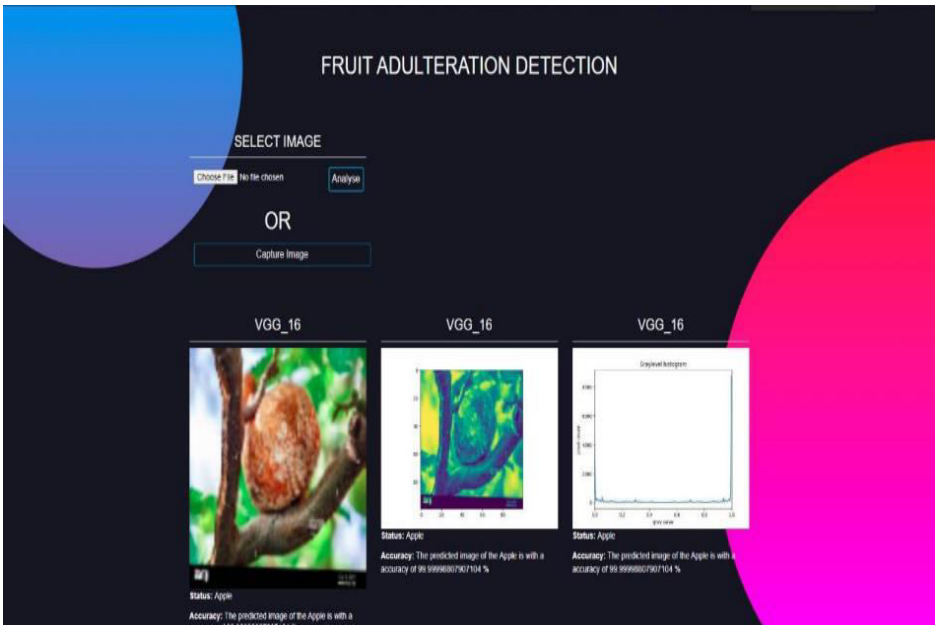


Fig 3: Adulteration detection stages

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

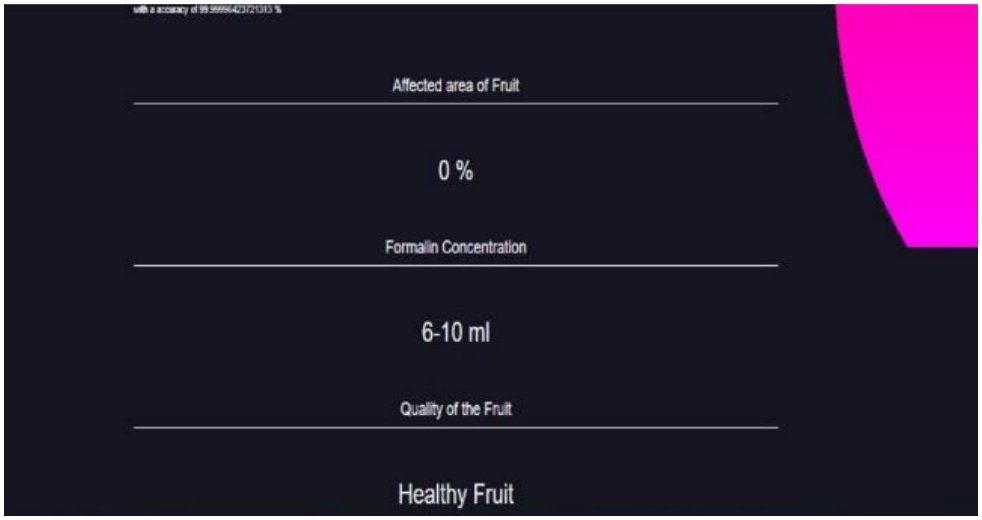


Fig 4: Adulteration detection results for fresh fruit

Fig 5: Adulteration detection results for unhealthy fruit

V. CONCLUSION AND FUTURE WORK

Fruit adulteration system can detect the concentration of formalin content in the fruit. The manual system fails to detect the formaldehyde level accurately and the use of gas sensors in formalin detection is costly. This project aims to find howmuch percent the fruit is adulterated with the formalin and depicts the fruit is consumable or not. This model will be useful for the consumers to safe check the quality of the fruit. To get better resultsin the classification and identification of adulterated fruit, VGG16 architecture is used.

The proposed system only work for two types of fruits that is the apple andorangeand the dataset must include the information about the naturally and artificiallyaddedformalin. The future scope of this system aims at giving more sophisticated predictionmodels, risk calculation tools and feature extraction tools for other fruits as well.

REFERENCES

1. Md. Ashraf Kamal, 2 Nafiza Nusrat, 3 Nowrin Siddique Dola, "DesignandDevelopmentof A Formalin Detection System Using IoT", International Journal ofScientific & Engineering Research Volume 10, Issue 9, September-2019 344ISSN2229-5518.
2. Shaikh Rakhshinda Nahid M.Ayyub ,Aarti Manjramkar "Fruit Disease Classificationand Identification using Image Processing", Proceedings of the Third International Conference on Computing Methodologies and Communication (ICCMC2019) IEEEXplore Part Number: CFP19K25-ART; ISBN: 978-1-5386-7808-4..

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007044 |

3. Nikhitha M, Roopa Sri S, Uma Maheswari B "Fruit Recognition and Grade of DiseaseDetection using Inception V3 Model", Proceedings of the Third International Journal onElectronics Communication and Aerospace Technology [IEEE 2019].
4. Anjana Purushothaman and Maruveetil, "Food Adulteration Detection Using MachineLearning" International Journal of Applied Engineering Research ISSN0973-4562Volume 14, Number 5, 2019.
5. Kawaljit Kaur and Chetan Marwaha "Analaysis of diseases in fruits usingimageproccessing techniques" 978-1-5386-0566-0/17/$31.002019 IEEE.
6. P. Kanjana Devi, Dr. Rathamani "Image Segmentation K-Means Clustering Algorithmfor Fruit Disease Detection Image Processing", Fourth International Journal onElectronics, Communication and Aerospace Technology (IEEE-2020).
7. R. Ramya, Dr. P. Kumar, K. Sivanandam, M. Babykala, " Detectionandclassification of fruit diseases using image processing & cloud computing", IEEE, 2020.
8. Miss. Supriya V. Patil, Miss. Vaishnavi M. Jadhav, Miss. Komal K. Dalvi, Mr.B.P.Kulkarni, "Fruit Quality Detecction using OpenCV/Python", International Research Journal of Engineering and Technology (IRJET), May 2020.
9. Lisha Kamala.K, Dr. Sini Anna Alex , "Development of Machine LearningbasedFruit Detection and Grading system" 2021 2nd International Journal onSmart Electronics and Communication, 2021 IEEE.
10. S. Prince Sahaya Brighty, G. Shri Harini, and N. Vishal "Detection of AdulterationinFruits Using Machine Learning", 2021 Sixth International Conference on WirelessCommunications, Signal Processing and Networking (WiSPNET) | 978-1-6654-4086-8/21/$31.00, 2021 IEEE.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details