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Web Based Application for Recognition of Deterioration in Fruits by Machine Learning

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Abstract – The project defines a fruit classification for identifying adulteration in fruits using shape and complexion. The motive of this experimentation is to find the adulterated fruits using machine learning approaches. Firstly, the various types of fruits are taken, both adulterated and unadulterated they are captured using webcam. Then appearance, pigmentation and texture are extracted from these images. Machine learning algorithm like CNN is used for classification. The highest classification accuracy is obtained from feature extraction.

Index Terms – Adulteration detection, CNN Algorithm, Image Acquisition, feature extraction, Image Segmentation.

1. INTRODUCTION

Adulteration is the illegal practise of adding raw and other less expensive substances to increase the number of high-quality commodities/products. Before we consume, we must verify whether the fruit or vegetable is fresh. In the olden days we were able to get good quality fresh fruits but nowadays technology has improved and fruits are getting adulterated. Fruits, vegetables or any food we intake is added by a chemical substance to increase its texture and shelf life of a fruit. we must be aware of the adulteration prior to the consumption. Detection of contaminated fruits is research subject that involves developing a computer system that can identify the presence of formalin, as well as the process of food adulteration, which involves the addition of small amounts of non-nutritious substances. Adulteration in fruits and vegetables is most commonly caused by a toxic toxin. Let's imagine a person taking a field trip, and seeing a shop or a supermarket on the roadside, he or she would like to know whether it's a fresh or any other adulterated fruit but have no idea about what kind of fruit it could be. With a good digital camera and a recognition program, one could get some useful information. fruits play an important role in our environment.

2. RELATED WORKS

Fruit classification is automated using computer vision, which is an appealing application. Computer vision algorithms that identify a fruit centred on its intensity, shade and quality. In this study, a conventional ways classifying fruits based on fineness is preferred. The traditional method of fruit classification relies on manual operation and visual skills. The data is classified by applying a Support Vector Machine (SVM) classifier elicited from probabilistic features provided by the wavelet transform.

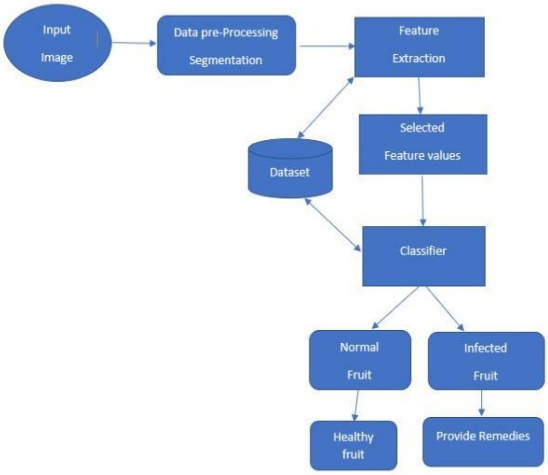
As gas sensing materials, phenylenediamine (OPD) nanocomposites containing various functionalized single walled carbon nanotubes (f-SWCNTs) were employed. The gas sensors were placed to the test to know how they react to different volatile organic compounds (VOCs).

Colour and size are two of the most important characteristics for correctly classifying fruit maturity. The purpose of this research is to determine whether the fruit is healthy or not to consume. Fruit classification is related on perfection is a feasible method for all fruit vendors. Here we have numerous similarities among a cherry and apple, and many different sorts of resemblance exist in many different varieties of fruits, therefore classification is crucial/difficult. However, using machine learning methods such as SVM and CNN, there are issues with fruit classification. As a result, ANN have been used to resolve issues. This method was implemented by use of a Raspberry Pi, a small computer with enough processing power to run an image processing application. The developed image processing system can estimate the fruit size and determine the color of the fruit using K-means clustering.

3. OVERVIEW OF THE PROJECT

The primary goal of this system is to discover the quality of the fruit. The model extracts the learning features and classify the fruit image as adulterated or not. The fruit is classified using CNN Algorithm where it takes in an input image of size 224×224(×3 color channels), and applies a convolution of size 3×3 (with 64 kernels/output channels) with a stride of 1 and a padding of 1. If fruit is adulterated then the system will display the remedies. The photos were taken with a camera that was attached to the laptop (web cam). The Further pre-processing of the collected photos is performed.

BLOCK DIAGRAM:



Data Pre-processing: The camera's photos are subjected to pre-processing for[22] increasing the property of the images. The[22] pre-processing includes the following steps: color transformation, noise removal, histogram equalization etc. By using the technique of color transformation, the picture quality increases. Conversion of RGB image to Grey and also HSI to increase the quality.

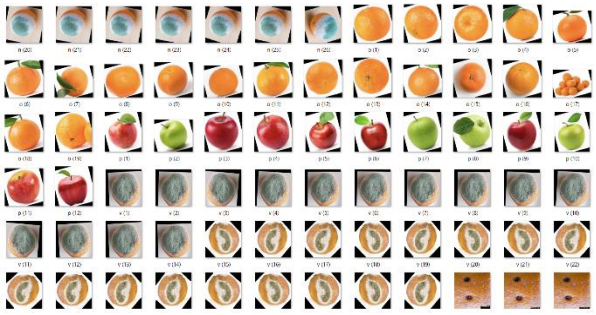
Feature Extraction: It is the process of extracting features from pre-processing which gives more accuracy. There are many features of an image. Here we are considering three feature that are texture, color and shape.

Classifier: Photos are classified by CNN. To notice particular quality for detecting adulteration, a mixture of numerous features is employed to compute the relevant characteristic.

4. EXPERIMENTAL ANALYSIS

1.Datasets

A dataset is nothing more than a collection of data. These data sets are crucial in Machine Learning when it comes to training a model. The higher the number of datasets you use to train your model, the more accurate it will be. We developed our own dataset by using a webcam to capture an image of actual apples. The dataset contains two types of fruits: 'Apple' and 'Orange.' The dataset is divided into two parts training and test dataset, with 75% of data used to trained model and 25% used to test it.



Training Dataset

Testing Dataset: Real Fruits captured using webcam.

3. Adulteration detection

Contaminated is described "the addition or removal of any component from or to food, affecting the natural content and quality of the food substance." Adulterants removes nutritional substances in food which is efficient to human life. It also increases the shelf life of a fruit and it can be preserved for longer days.

Some adulterants are the toxic substances which is harmful to health and these can be found by using some of the methods. One of the methods is using web application which will find the adulterated fruit by its color and texture. If the fruit is adulterated then the remedies will also been displayed.

5. FRUIT CLASSIFICATION

CONVOLUTION NEURAL NETWORK

Convolutional:

From given image data the features are extracted. It takes input in the form of matrix as shown in Figure 1. By applying filters feature map is obtained. There are 256 feature maps. It is class of deep neural network and it is used for pattern recognition in portrait. These are used for geographic information analysis, computer vision, NLP, signal processing, and various methods. Convolution is the procedure where there will be two information sources it will change function into something. It will apply convolution to the input then the result will be input to the upcoming layer. It converts pixels into single value. The final output will be in vector of this convolution layer. The human brain has huge amount of information. It is the building block C-neural network.

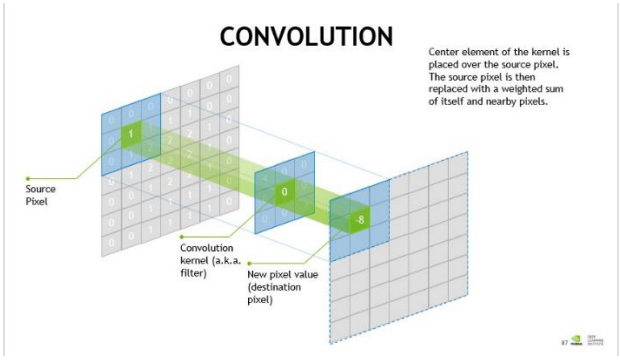


Figure: 1 Convolution layer

Pooling:

It is the second layer of CNN and it is used to reduce dimensions. It summarises the characteristic present in the region of feature map. The problem of convolution is overcome in this layer. Pooling is applied on the future map and a non-linear activation function. It is very similar to the convolution and there are two kinds: Max and average. In max pooling the[1] maximum value is calculated and in average pooling the sum of elements is found. For image classification is required.

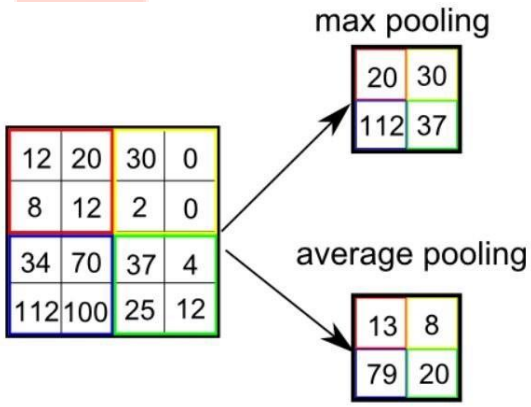


Figure: 2 Pooling Layer

Fully Connected:

It is the third and simple layer and it is called feed forward neural networks. It forms the last few layers of CNN. These are set of dependent non-linear functions. The linear transformation is appealed to the i/p vector by axons. Then the non-linear transformation is applied to activation function. It is sometimes called as densely connected. There will be all connections to each layer and every input of input vector reflects the output. It is sliding dot product where the input matrix is with the kernel shifts and they both were vectors. In this we have 3 feature units. The non-linear function is learnable parameters in the network. The nodes here are called as neurons.

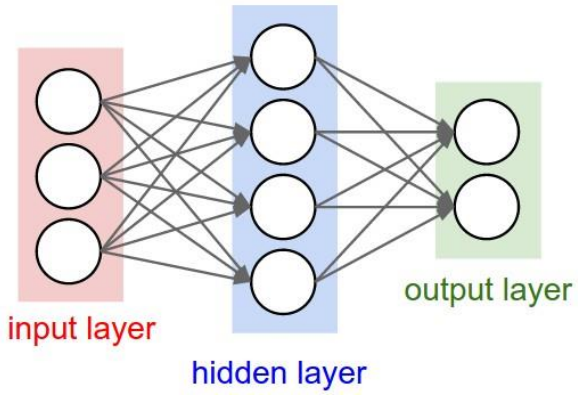


Figure: 3 Fully Connected Layer

6. RESULT AND DISCUSSION

The input is given as photograph in the form of pixels. In convolutional layer, the features are extracted[1]. In pooling layer, the image size is reduced by multiplying array of pixels with the filter or kernel which may be in small size[1]. These filters are used to make the portrait smaller. The first layer produces output in the form of single dimensional array. The filters are put many times to reduce the size. At the end, feature map is obtained and with reduced dimension[1] is obtained.

In picture recognition, it will frequently carry information about grey scale, appearance, structure, or conditions. It is a crucial area of CS that deals with picture recognition. We have used CNN algorithm to classify data. Using image classification, high-level knowledge of the object is obtained.

During the classification phase, the item, which is not known in the query picture, is contrast to each sample of same or other items that were used to train. Train set of fruits named train set y has a high accuracy of 87 percent, whereas the test group of fruit named test y[21] has a 95 percent accuracy.

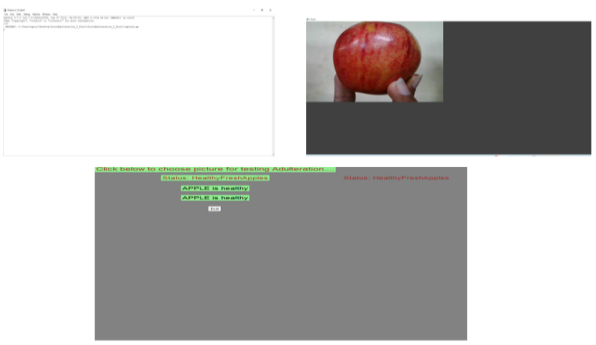


Fig. Detection of fresh fruit using webcam

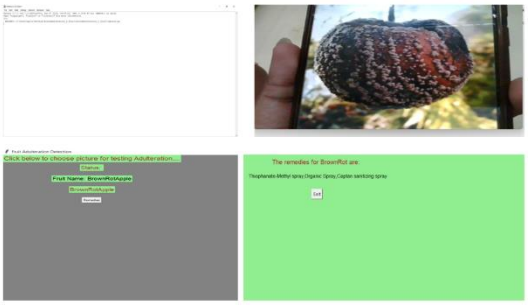


Fig. Detection of rotten fruit using webcam

7. CONCLUSION

Research about Fruit categorization is important that should be investigated and development sources because, refinement can have performance on agriculture and the class of fruits provided at[1] market and dime stock.

It is Machine learning-based web application for detecting of fruit adulteration. As a result, the study demonstrates whether the fruit is adulterated or not using machine learning techniques. This proposed system is an adulteration finding technique based on ML approaches by using a CNN (convolutional neural network) are applied to the exploratory dataset to create a prediction copy. By using this algorithm, we can easily classify the fruit whether it is adulterated or not. This system detects adulterated fruit and consumption can be dependent on the safety status of the fruit found and it display the result as safe or unsafe. If the fruit found is adulterated then it will show the remedies.

FUTURE ENHANCEMENT

It can be implemented on large fruits like Watermelon, papaya, Dragon Fruit, Musk melon etc. The concentration of the adulterants can also find as the future work.

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REFERENCES

[1] R.S. Latha, G.R. Sreekanth, R.C. Suganthe, M. Geetha, N. Swathi, S. Vaishnavi, P. Sonasri. "Automatic Fruit Detection System using Multilayer Deep Convolution Neural Network" ,2021 International Conference on Computer Communication and Informatics (ICCCI), 2021.

[2] Monika Jhuria, Rushikesh borse, Ashwani Kumar, "Image Processing for Smart Farming: Detection of Disease and Fruit Grading". International Conference on Intelligent Computing and Control Systems ICICCS 2017, 978-1-5386-2745- 7/17/$31.00 ©2017 IEEE

[3] M. Nikhitha, S. Roopa Sri, B. Uma Maheswari "Fruit Recognition and Grade of Disease Detection using Inception V3 Model", 2017 International Conference on Communication, Computing and Digital Systems (C-CODE) 978-1-5090-4448-1/17/$31.00 ©2019 IEEE

[4] P. Kanjana Devi, Rathamani, "Image Segmentation K-Means Clustering Algorithm for Fruit Disease Detection Image Processing", IEEE2020.

[5] Kawaljit Kaur, Chetan Marwaha "Analaysis of diseases in fruits using image processing techniques" 978-1-5386-0566-0/17/$31.00 ' 2017 IEEE.

[5] Miss. Shital A. Lakare1, Prof: Kapale N.D2, "Automatic Fruit Quality Detection System".

[6] Food Adulteration - an overview | ScienceDirect Topics", Sciencedirect.com, 2018.

[7] FOOD ADULTERATION PART-II FRUITS/VEGETABLES All that shines is not pure! | All India Exservicemen Joint Action Front (Sanjha Morcha)", Sanjhamorcha.com, 2018.

[8] Adulteration and Harmful effects of Food Adulteration", India Study Channv

el, 2018.

[9] F. C. Bato, T. J. G. Bautista, and C. D. Cortez, "Development of formaldehyde detector," International Journal of Information and Electronics Engineering, 2016.

[10] R. Ramya, Dr.P. Kumar, K. Sivanandam, M. Babykala," detection and classification of fruit diseases using image processing & cloud computing", IEEE,2020

[11] Koirala, A., Walsh, K. B., Wang, Z., & McCarthy, C. (2019). Deep learning–Method overview and review of use for fruit detection and yield estimation. Computers and Electronics in Agriculture, 162, 219-234.

[12] Xue, G., Liu, S., & Ma, Y. (2020). A hybrid deep learning-based fruit classification using attention model and convolution autoencoder. Complex & Intelligent Systems, 1-11.

[13] Khan, R., & Debnath, R. (2019). Multi class fruit classification using efficient object detection and recognition techniques. International Journal of Image, Graphics and Signal Processing, 11(8), 1.

[14] Peng, Y., Liao, M., Deng, H., Ao, L., Song, Y., Huang, W., & Hua, J. (2020). CNN–SVM: a classification method for fruit fly image with the complex background. IET Cyber-Physical Systems: Theory & Applications, 5(2), 181-185.

[15] Suganthe, R. C., Latha, R. S., Geetha, M., & Sreekanth, G. R. (2020). Diagnosis of Alzheimer's Disease from Brain Magnetic Resonance Imaging Images using Deep Learning Algorithms. Advances in Electrical and Computer Engineering, 20(3), 57-64.

[16] Latha, R. S., Sreekanth, G. R., Akash, P., & Dinesh, B. (2020). BRAIN TUMOR CLASSIFICATION USING SVM AND KNN MODELS FOR SMOTE BASED MRI IMAGES. Journal of Critical Reviews, 7(12), 1-4.

[17] Latha, R. S., Sreekanth, G. R., Suganthe, R. C., & Geetha, M. Hybrid Binary Gray Wolf Optimization for finding Optimal Features in Classification Problems

[18] Patel, H.N., Jain, R.K., Joshi, M.V.: Fruit detection using improved multiple features-based algorithm. Int. J. Comput. Appl. 13(2), 1–5 (2011)

[19] Zeng, G.: Fruit and vegetables classification system using image saliency and convolutional neural network. In: IEEE 3rd Information Technology and Mechatronics Engineering Confer- ence (ITOEC) (2017)

[20] Zhang, G., Chen L., Ding, Y.: A multi-label classification model using convolutional netural networks. In: 29th IEEE conference on Chinese Control and Decision Conference (2017)

[21] S. Prince Sahaya Brighty, G. Shri Harini, N. Vishal. "Detection of Adulteration in Fruits Using Machine Learning", 2021 Sixth International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 2021.

[22] "Computational Vision and Bio-Inspired Computing", Springer Science and Business Media LLC, 2020