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A Review on Fruit Export and Advisory App Using Deep Learning

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Abstract: *This electronic document is a "live" template and already defines the components of your paper [title, text, heads, etc.] in its style sheet. Because of the agriculture sector's vital role in global food production and sustainability, fruit quality is critical. Traditional methods of fruit quality evaluation are time consuming and subjective, resulting in inefficiencies in the supply chain and significant food loss. Our research provides a novel solution. By evaluating fruit photos, our algorithm detects fresh versus sub optimal quality fruits using cutting-edge machine learning techniques. Our model correctly identifies ripeness, flaws, and deformities across multiple fruit varieties using deep learning with CNNs at its heart and transfer learning. Implementing this technology reduces food waste and promotes sustainable agriculture by streamlining fruit quality testing. It helps farmers, distributors, and consumers by guaranteeing that only the best fruits make it to market. Our study provides a cost effective, environmentally friendly, and long-term solution.*

Keywords: Fruit quality assessment, deep learning, CNN, transfer learning, sustainable agriculture, food waste reduction, fruit grading, mobile application, agriculture technology, image processing.

I. INTRODUCTION

Ensuring the quality of fruits is a critical factor in the agricultural industry, impacting consumer satisfaction, market value, and overall profitability. Traditionally, fruit quality assessment has relied on manual inspection, which is labour-intensive, subjective, and prone to errors. The introduction of automated fruit quality detection using image processing and machine learning, specifically convolutional neural networks (CNNs), offers a promising solution to this challenge. Convolutional Neural Networks (CNNs), a type of deep learning model, have proven to be highly effective in tasks involving image classification and pattern recognition. By leveraging CNNs for fruit quality detection, it becomes possible to accurately classify and grade fruits based on various visual features such as colour, texture, shape, and surface defects. Image processing techniques play a crucial role in preprocessing and enhancing the quality of input images, enabling the CNN model to focus on relevant features for accurate detection. The proposed system involves capturing images of fruits using a standard camera, preprocessing the images through techniques such as noise reduction, resizing, and normalization, and then passing them through a CNN model trained to distinguish between high-quality and defective fruits. The CNN analyses features like bruises, discoloration, irregular shapes, and other imperfections that impact fruit quality. This automated approach not only improves the speed and accuracy of quality assessment but also reduces labour costs and minimizes human error.

II. DISCUSSION

We first look at the current agriculture and quality assessment applications, considering their features, limitations, and effect on the supply chain's efficiency. Our application will be developed to use CNNs and a transfer learning framework so as to detect the ripeness, flaws, and deformities in the fruit image as accurately as possible. Agile

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methodology has been adopted throughout the development to provide flexibility and incorporate the feedback from users.

The application is built with both TensorFlow Lite for the inference of the model at runtime on a mobile device and Java for tight integration within Android. The application is user-friendly with interaction through native Android interface for smooth performance and availability to all end-users, like farmers and distributors.

In terms of scalability and robustness, the architecture is designed to accommodate a rapidly growing dataset of various fruit types and quality conditions. This microservice-based structure, therefore, lends itself well to maintainability and possibly modular updates - perhaps new fruit types or the improvement of grading accuracy. Technology integration within the fruit supply chain provides an application with a practical and cost-effective

III. LITERATURE REVIEW

It has led to some important developments by integrating deep learning and machine learning technologies within the agricultural domain with regard to automated detection and evaluation of fruit quality and diseases. Conventional methods of testing fruit quality have traditionally been labour-intensive, often inconsistent, and therefore inefficient in the supply chain for agriculture.

A. Fruit Quality Detection using Deep Learning for Sustainable Agriculture by B Lakshmi Sirisha, B Jayendra Nayak, sai Sndhya, J Eswara Rao, M Devisri

Because of the agriculture sector's vital role in global food production and sustainability, fruit quality is critical. Traditional methods of fruit quality evaluation are time consuming and subjective, resulting in inefficiencies in the supply chain and significant food loss. Our research provides a novel solution. By evaluating fruit photos, our algorithm detects fresh versus suboptimal-quality fruits using cutting-edge machine learning techniques. Our model correctly identifies ripeness, flaws, and deformities across multiple fruit varieties using deep learning with CNNs at its heart and transfer learning. Implementing this technology reduces food waste and promotes sustainable agriculture by streamlining fruit quality testing. It helps farmers, distributors, and consumers by guaranteeing that only the best fruits make it to market. Our study provides a cost effective, environmentally friendly, and long-term solution.

B. A Review on Automated Detection and Assessment of Fruit Damage Using Machine Learning by YONASI SAFARI, JOYCE NAKATUMBA-NABENDE, ROSE NAKASI, AND ROSE NAKIBUULE

Automation improves the quality of fruits through quick and accurate detection of pest and disease infections, thus contributing to the country's economic growth and productivity. Although humans can identify the fruit damage caused by pests and diseases, the methods used are inconsistent, time-consuming, and variable. The surface features of fruits, typically observed by consumers who seek health benefits, significantly affect their market value. The issue of pest and disease infections further deteriorates fruits' quality, becoming a mounting stressor on farmers since they reduce the potential revenue from fruit production, processing, and export. This article reviews various studies on detecting and classifying damages in fruits. Specifically, we review articles where state-of-the-art approaches under segmentation, image processing, machine learning, and deep learning have proved effective in developing automated systems that address hurdles associated with manual methods of assessing damage using visual experiences. This survey reviews thirty-two journal and conference papers from the past thirteen years that were found electronically through Google Scholar, Scopus, IEEE, ScienceDirect, and standard online searches. This survey further presents a detailed discussion of previous research done in the past while emphasizing their strengths and limitations as well as outlining potential future research topics. It also reveals that much as the use of automated detection and classification of fruit damage has yielded promising results in the horticulture industry, more research is still needed with systems required to fully automate the detection and classification processes, especially those that are mobile phone-based towards addressing occlusion challenges.

C. An Integrated Framework of Two-Stream Deep Learning Models Optimal Information Fusion for Fruits Disease Recognition by Unber Zahra , Muhammad Attique Khan , Member, IEEE, Majed Alhaisoni , Areej Alasiry, Mehrez Marzougui , and Anum Masood

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Diseases impact the rates of production of many agricultural goods. These diseases require detection, which is difficult to do manually. Therefore, the creation of some automated illness detection systems is urgently required. Deep learning showed significant success in the area of precision agriculture for the recognition of plant disease. Compared with the traditional techniques, the deep learning architecture automatically extracts deep features from the deeper layer. In this work, we proposed a new automated method for classifying apple and grapefruit leaf disease recognition utilizing two-stream deep learning architecture. The proposed framework entails several steps. The first phase is picture contrast enhancement, which combines the information from DnCNN and top–bottom hat filtering to create a better image. Then, the augmentation process uses horizontal and vertical flips to increase the dataset's original size. The Inception-ResNet-V2 deep learning model is then adjusted and trained using deep transfer learning on the expanded dataset. After being extracted from the training model, the best features are chosen using two techniques—an entropy-based strategy and tree growth optimization. Finally, a new effective method combines the chosen features, and machine learning classifiers are used to complete the classification. On the augmented dataset, the proposed framework correctly classified apple and leaf diseases with the accuracy rates of 99.4 respectively.

D. Fruit Quality Recognition using Deep Learning Algorithm by Prof.Sarika Bobde, Prof.Pradnya Kulkarni, Pranav Khode, Sarthak Jaiswal, Omkar Patil, Rishabh Jha

Fruit classification is essential in various industrial settings, such as factories, supermarkets, and other places. Fruit classification may also be beneficial to persons with unique nutritional needs who utilize it to choose the proper fruits. Manual sorting was formerly used for fruit classification is time-consuming and requires continual human presence. Many fruit classification machine learning techniques have been proposed in the past. Deep learning may be a powerful engine for generating actionable results in today's reality because of its detection and classification abilities. As a result, a convolutional neural network was employed to construct an effective fruit classification model. It makes use of the fruits 360 dataset, which contains 131 different fruit and vegetable varieties. In this paper, we used three fruits, divided into three categories: good, raw, and damaged. The model was made in Keras. It had been trained for 50 epochs and had a 95% accuracy.

E. Highly Efficient Machine Learning Approach for Automatic Disease and Color Classification of Olive Fruits by NASHAAT M. HUSSAIN HASSAN, A. A. DONKOL, M. MOURAD MABROOK AND A. M. MABROUK

The following ends have been established via an in-depth examination and assessment of numerous prior studies on olive fruit classifications: First, several of these researches rely on the use of an unrelated image library. Since every image features a single fruit with a background that contrasts sharply with the fruit's hue, they are all ready for testing. As was previously stated, this issue is unrelated to reality. In practical application, one must deal with a frame that holds hundreds of fruits. To keep the fruits steady, they are put on a conveyor with multiple channels. It's also notable that the majority of this study offered suggestions for useful technology that could yet be developed. Finally, it is important to emphasize that processing speed data is essential in this type of application and has not been collected in many of these experiments.

IV. PROPOSED SYSTEM

The proposed system for fruit quality detection leverages Convolutional Neural Networks (CNN) and advanced image processing techniques to automate the process of assessing and classifying fruit quality. This system addresses the limitations of existing methods by providing a scalable, accurate, and efficient solution capable of detecting both external defects (such as bruises, discoloration, and irregular shapes) and internal defects. An Export Module is incorporated with the module offering a suggestion on the most appropriate region or country for export of fruits considering its quality. This can be possible by grading the whole product and comparison to export market standards regarding the acceptable level of defects, size, and ripeness of the fruit. The system will not only be able to classify and grade the fruit but also help in identifying optimum market sources for export, which would further increase the efficiency of trade and reduce waste.

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Key Features –

- Automated defect detection.
- Real-time processing for immediate fruit analysis.
- Reduced labour costs by automating the inspection process.
- This system offers a fast & reliable solution for consistent fruit quality control.

IV. SYSTEM ARCHITECTURE

The architecture of the proposed system consists of several layers that work together to deliver accurate fruit quality detection and export recommendations. These components interact seamlessly to process images, classify fruit quality, and suggest optimal export regions.

1. Input Layer
2. Image Pre-Processing
3. Quality Detection Layer
4. Export Module
5. Database Layer
6. Output Layer

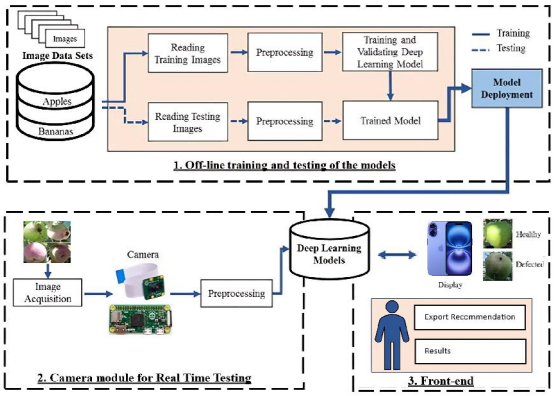

Fig 1: System Architecture

VII. SYSTEM REQUIREMENTS

Hardware Interfaces:

- RAM : 8 GB As we are using Machine Learning Algorithm and Various High Level Libraries Laptop RAM minimum required is 8 GB.
- Hard Disk : 40 GB Data Set of CT Scan images is to be used hence minimum 40 GB Hard Disk memory is required.
- Processor : Intel i5 Processor
- IDE : Android Studio
- Coding Language : Kotlin
- Operating System : Windows 10 XX 4.1.3

Software Interfaces:

- Operating System: Windows 10
- IDE: Android Studio
- Programming Language : Kotlin

External Interface Requirement:

- Fruit Quality and Export Advisory App

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VIII. SCOPE

1. Utilizing deep learning for accurate fruit quality and grading assessment.
2. Integrating image processing techniques to identify and classify fruit types and detect quality defects.
3. Providing export recommendations based on quality standards tailored to different countries.
4. Offering a quality rating system to support informed decision-making for exporters.
5. Enabling a mobile-based platform with an intuitive interface using Android native development (Java and XML).
6. Supporting scalability and adaptability for various types of fruits and agricultural products.

VIII. CONCLUSION

The integration of CNNs with fruit quality detection is a giant step forward in agriculture to boost efficiency, accuracy, and sustainability. It enables real-time, automated assessment that enhances sorting and quality control throughout the entire supply chain-from orchards, through warehouses and cold stores, and on to the retail shelf. This reduces human error while accelerating decision-making to help maintain high standards, minimize waste, and improve operational efficiencies. Their flexibility enables their use on many types of fruits; thus, they can also support the diversified agricultural needs that come along with those concerning quality measures. Developing CNN technology will not only further advance innovation in quality detection but also ensure a healthy practice that further cements food security and consumer satisfaction. This is more efficient in producing and delivering the harvest, and it ushered the responsible future in the agriculture sector of food production.

REFERENCES

[1] Hongshe Dang, Jinguo Song, Qin Guo, “A Fruit Size Detecting and Grading System Based on Image Processing,” 2010 Second International Conference on Intelligent Human-Machine Systems and Cybernetics,pp83- 86.
[2] John B. Njoroge. Kazunori Ninomiya. Naoshi Kondo andHideki Toita, “Automated Fruit Grading System using ImageProcessing,” The Society of Instrument and Control Engineers(SICE2002), Osaka, Japan, August 2002, pp 1346-1351.
[3] J. V. Frances, J. Calpe, E. Soria, M. Martinez, A. Rosado, A.J.Serrano, J. Calleja, M. Diaz, “Application of ARMA modeling to the improvement of weight estimations in fruit sorting and grading machinery,” IEEE 2000, pp 3666-3669.
[4] Wong Bing Yit, Nur Badariah Ahmad Mustafa, ZaipatimahAli, Syed Khaleel Ahmed, Zainul Abidin Md Sharrif, “Design and Development of a Fully Automated Consumer-based Wireless Communication System for Fruit Grading”, ISCIT 2009, pp 364- 369.
[5] D. Lee, J. Archibald and G. Xiong, “Rapid Colour Grading for Fruit Quality Evaluation Using Direct Colour Mapping”, IEEE Transactions on Automation Science and Engineering, Vol 8, No.2, pp.292-302, April 2020