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FRUIT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

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ABSTRACT:

Fruit detection using machine learning represents a significant step toward a more efficient, automated, and informed fruit industry, benefiting producers, processors, and consumers alike. It presents a comprehensive approach for fruit detection and classification employing machine learning techniques. The methodology involves image preprocessing, feature extraction, and the implementation of various classification to accurately identify and categorize fruits. The proposed model demonstrates promising results in accurately detecting and classifying different types of fruits, showcasing its potential for use in agricultural automation and food industry applications.The fruit business has found computer vision and image processing techniques to be more and more helpful in recent years, particularly for applications in quality inspection and fruit color, size, and form sorting. This study discusses several image processing methods for classifying fruits.

Keywords: Teachable Machine , Tensor flowLite , Data Set , Classification , Machine Learning , Android Studio , CNN.

INTRODUCTION:

Fruit identification is an essential job in the retail, food processing, and agricultural sectors.Fruit recognition and sorting have been automated by machine learning, which has completely changed the procedure.Fruit detection that is effective guarantees quality control, minimizes waste, and enhances production procedures. It helps with inventory control, making it possible to track and distribute stocks more effectively.The recent revolution in numerous sectors, such as image identification and classification, can be attributed to the integration of machine learning techniques with mobile applications. Fruit identification and classification is an interesting area for this fusion to be used in. This field offers a wide range of practical applications, from automated inventory management to helping visually impaired people shop for groceries. With the use of machine learning methods, this project seeks to create a reliable fruit identification and categorization system that can be implemented on the Android platform using Android Studio. Through the utilization of convolutional neural networks (CNNs) and the widespread availability of smartphones,our goal is to develop a user-friendly and effective tool that can precisely detect and classify different fruits in real-time.

METHODOLOGY:

1.. Data Collection: Collect a big collection of photos depicting the various fruits you want to identify. Ensure that the dataset is diverse and reflective of real-world events.insert all the possible positions of the entered class where more database reflects in an desired output. there are some principles to get a validating data collection for an great accuracy

- There should be no duplication of a data
- The datas(images) should be clear(brightness, color objects)
- Collect more data for an particular class as far as possible

Data Preprocessing: Clean and prepare the photographs to guarantee consistency in size, lighting, and background. There should not be any duplication of the data that is entered (so that wastage of data can beprevented.

cutting out the unused datas

- 3-dimensional pictures of an object are preferable.
- easily detectable background to be fitted.
- non-duplicated pictures are advisable.

Feature Extraction: Using convolutional neural networks (CNNs), extract features from preprocessed images. CNNs are particularly successful at image classification jobs and tensorflow lite codes so that we could run the project in mobile phones .

- downloading android studio(for mobile application)
- download code from teachable machine(after trained)
- insert the required front end objects and back end codes

Model Evaluation: Model evaluation is an essential step in building reliable and effective machine learning models. Use validation data to evaluate the performance of your trained model. To improve performance, adjust the hyperparameters and model design as needed.Make the desired changes to those featured and systems.there are some steps to be followed to make a machine learning model evaluation:

Importing the database

Splitting it as (80% train and 20% test)

Train a model

Evaluating its performance such as accuracy,precision,speed of the output

Plot the confusion matrix and to visualize the prediction

Tensorflow lite

TensorFlow Mobile is a successor of TensorFlow Lite, it is employed for mobile platforms like Android and iOS (Operating System). It is used to develop the TensorFlow model and integrate that model into a mobile environment. since these tensorflow lite is well developed to integrate apps and their front end developments like layout, their colors ,their shapes, their designs and their wording.

Integration with Android Studio: Once you have a trained model, add it to your Android Studio project. You can deploy your model to Android smartphones using TensorFlow Lite or another framework. Write code to load the trained model, preprocess input photos, and compute inference for fruit detection and classification. Downloading the latest version of android studio to be followed by all the necessary tools to be installed along with them so that the tools are associated for running tensorflow lite model.

Set up the android studio workspace:

To begin with, download the latest version of android studio on yoursystem(windows,linux) depending on your OS and depending on your system(hedgehog, giraffe, etc) . download all possible tools for image classifier.

Create a New Android Project:

Open Android Studio and create a new Android project. Choose a suitable project name, package name, and minimum SDK version based on your requirements.

Prepare your machine learning model:

Before integrating your machine learning model into android studio, firstly we should it into a format thatis compatible with tensorflow lite model.

- Step 1:Data Collection for Machine Learning. ...
- Step 2: Preprocessing and Preparing Your Data. ...
- Step 3: Selecting the Right Machine Learning Model. ...
- Step 4: Training Your Machine Learning Model. ...
- Step 5: Evaluating Model Performance. ...
- Step 6: Tuning and Optimizing Your Model.

Include the model into android project:

Copy the converted TensorFlow Lite model (e.g., my_model.tflite) into theapp's assets folder. This folder contains static files bundled with the app.

Testing and Optimisation: Thoroughly test the application to ensure accurate fruit identification and classification under various settings. Optimize the application's performance and eflciency.there are someroutine to be followed for a typical test optimization:

Minimizing the size of the used test suites

1. Establishing the smallest possible subset of test suites capable of reaching the required goals
2. Getting rid of excessive test cases
3. Analyzing the optimal test coverage criteria
4. Improving test case maintenance

RESULTS:

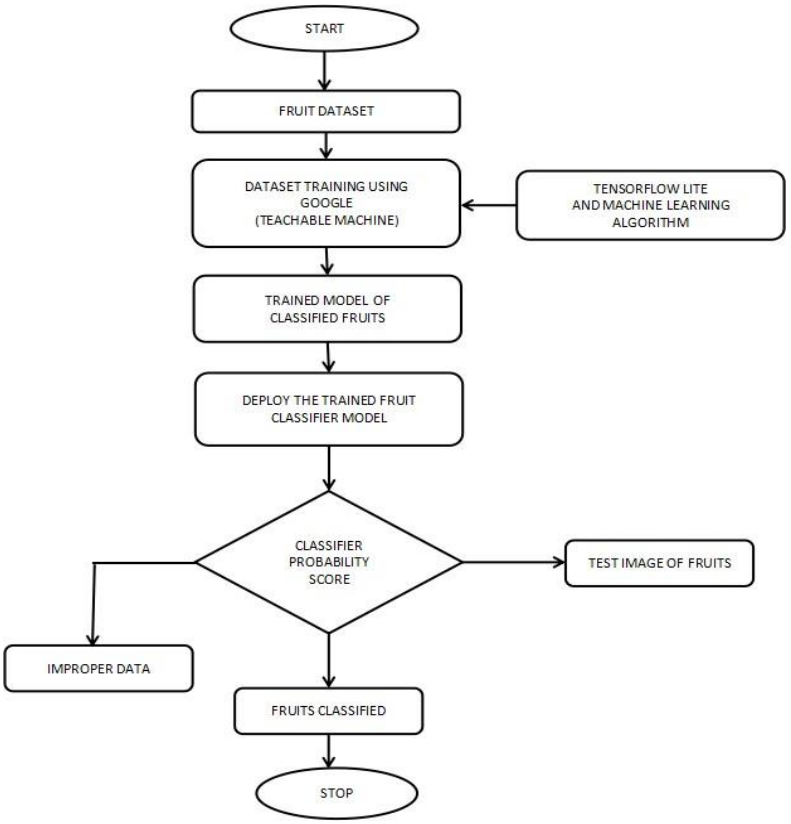

Fig 1 : Flowchart

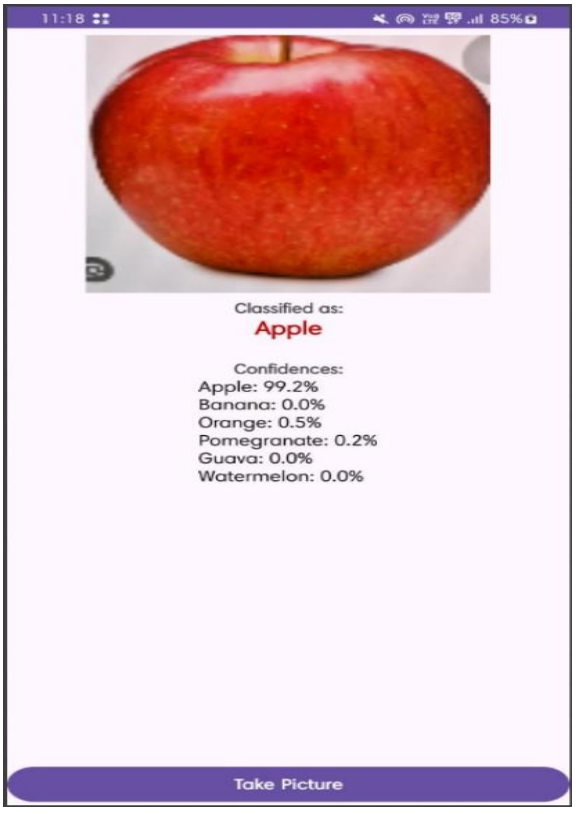

Fig 2: Output

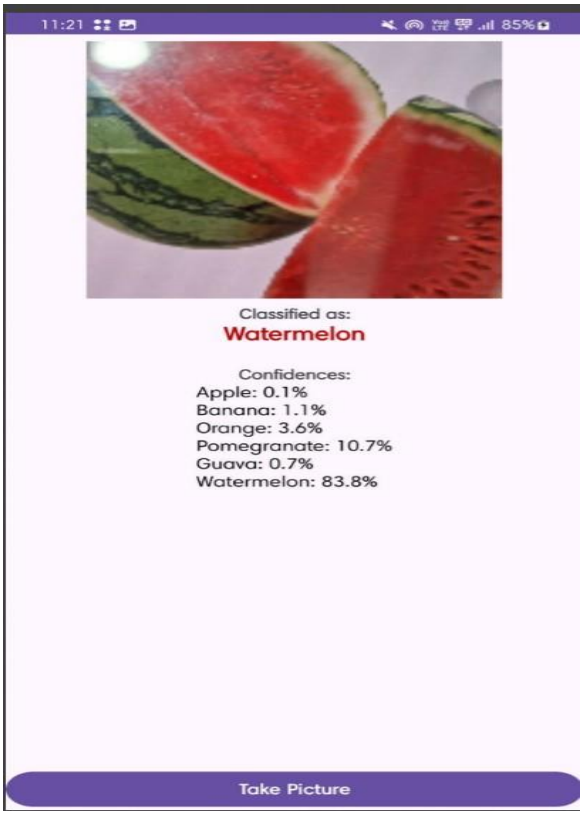

Fig 3: Output

CONCLUSION:

In conclusion, by automating procedures, guaranteeing quality, and fostering sustainability, machine learning-based fruit detection and categorization has significantly improved the fruit sector. Growers and consumers both benefit from these developments. We can focus on local fruit and vegetable image classification in the future. It can also be used to classify and identify herbal plants, leaves, and flowers. It is possible to design a system that will recognize and deliver information on herbal plants, leaves, and flower.s. We can also work on some more categorization elements that can distinguish between different illness types and/or fruit textures and structures. These are all directions for the future. Working on these can help create a prototype model that can be utilized in industries.Based on the aforementioned techniques, mobile applications can be created for the same purpose, which farmers and the general public can use to identify and categorize horticulture items.

REFERENCES:

1. Fruit Categorization And Disease Detection Using ML Saleem Ulla Shariff , M G Guru Basavanna, Dr.C R Byrareddy, Malini V L, Nandhini V L INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 11, NOVEMBER 2020

2. MACHINE LEARNING APPROACH FOR PREDICTING FRUIT FRESHNESS CLASSIFICATION Ganesan Mudaliar1,
3. Rashmi Priyadarshini B.K2 issued 5 may 2021

4. Classification of Affected Fruits using Machine LearningHeena Shaikh, Yashashree Wagh, Siddhesh Shinde, Shankar M. Patil Special Issue – 2021

5. R. A. A. Al-Fallujah, “Color, shape, and texture based fruit recognition system,”International Journal of Advanced Research in Computer Engineering & Technology, vol. 5, pp. 2108–2112

6. Gomes et al., “Applications of computer vision techniques in agriculture and food : a review”, Eur. Food Res. Technol

7. Diego Sebastián Pérez et al., “Image classification for detection of winter grapevine buds in natural conditions using scale-invariant features transform, bag of features and support vector machines”, Computers and Electronics in Agriculture 135, 81– 95, January 2017.

8. R. A. A. Al-Fallujah, “Color, shape, and texture based fruit recognition system,”International Journal of Advanced Research in Computer Engineering & Technology, vol. 5,pp. 2108–2112, 2016.

9. Rashmi Pandey et al.,” Image Processing and Machine Learning for Automated Fruit Grading System: A Technical Review”, International Journal

10. Naik et al, “Shape, size and maturity features extraction with fuzzy classifier for non-destructive mango (Mangifera Indica L., cv. Kesar) grading”,TIAR(978-1-4799-7758-1), 5-11, July 2015.

A. Vyas et al, "Colour Feature Extraction Techniques of Fruits: A Survey",International Journal of Computer Applications (0975 – 8887) Volume 83 – No 15,December 2013.

11. Fruit Detection Using Faster R-CNN Based On Deep Network by Linjuan Ma1,Fuquan Zhang2, Lin Xu3; School of Computer Science and Technology, Beijing Institute of Technology, 100081 Beijing,

12. Faster R-CNN with Classier Fusion for Small Fruit Detection by Xiaochun Mai,Hong Zhang and Max Q.-H. MengJ., 2018 IEEE International Conference on Robotics and Automation (ICRA) May 21-25, 2018.