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Online Fruits and Vegetables Recycling and Reuse System

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Abstract: The global imperative to mitigate food waste and foster sustainable practices has led to the development of innovative solutions, among which the integration of deep learning techniques in an online fruits and vegetables recycling and reuse system stands as a promising approach. This paper outlines the conceptualization and implementation of an intelligent system leveraging deep learning to revolutionize the management of surplus or aesthetically imperfect fruits and vegetables The system's foundation rests upon a robust deep learning model trained to accurately assess and categorize the quality of fruits and vegetables based on visual attributes. Utilizing convolutional neural networks, the model can identify and classify produced items, distinguishing between those suitable for consumption, redistribution, or recycling based on Grade A, B, C. Through a user-friendly online platform, consumers, retailers, and farmers can seamlessly upload images of surplus or imperfect produce. The deep learning model swiftly evaluates the condition of these items, providing real-time assessments and recommendations.

Keywords: CNN, Machine Learning, Deep Learning, Visual Attribute.

I. INTRODUCTION

The Online Fruits and Vegetables Recycling and Reuse System emerges as a pivotal response to the pressing global concerns surrounding food waste and sustainability in the agriculture sector. In an era where food waste accounts for a significant portion of the world's discarded resources, and where the environmental impact of such waste is increasingly evident, Innovative solutions are imperative.

The Online Fruits and Vegetables Recycling and Reuse System stands as a beacon of hope, harnessing the power of digital technology to revolutionize the management of surplus fruits and vegetables.

II. BACKGROUND WORK & RELATED WORK

Grading fruits and vegetables for recycling and reuse is a crucial step in the agricultural industry to ensure quality control and meet consumer demands. Traditionally, grading has been performed manually, relying on visual inspection and subjective judgment. However, manual grading processes are labour-intensive, time-consuming, and prone to inconsistencies and errors. With the increasing demand for efficiency and accuracy in the grading process, there is a growing need for automation and technological solutions to streamline operations and improve productivity.

In recent years, there have been significant advancements in automated grading systems for fruits and vegetables. These systems leverage cutting-edge technologies such as computer vision, machine learning, and artificial intelligence (AI) to automate the grading process. By analysing images and data from produce, these systems can accurately categorize fruits and vegetables based on various parameters such as size, shape, colour, and defects.

Research in this area has explored different approaches, including neural networks, deep learning algorithms, and sensor-based technologies, to develop robust and efficient grading systems.[1] Nur-E-Aznin Mimma, Sumon Ahmed, Tahsin Rahman, and Riasat Khan, "Fruits Classification and Detection Application Using Deep Learning". This is based on computer vision and image processing technique which is used to classify various types of fruits on the basis of Machine learning techniques. Initially, the image is taken through a camera and then employed few preprocessing frameworks and then the detected fruit name is displayed.

[2] Ajay yadav, Anurag Acharya, Amartya Visen, Mrs. Amruta Patil "Fresh and rotten fruits classification using deep learning." By using Convolution neural network, the classification of fruits is defined here. In this initially the file should be uploaded and then the classification result will be occurred.

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III. METHODOLOGY

With the use of deep learning and visual attribute techniques, the system models will detect whether the fruits and vegetables belong to the Grade A, B, C.

A. IMAGE SELECTION*:*

The dataset, fruits and vegetable image dataset are implemented as input. The dataset is taken from dataset repository. The input dataset is in the format '.mp4'. In this step, we must read or load the input image by using the imread () function. The input image is used to detect or classify the input image. In our process, we use the tkinter file dialogue box for selecting the input image.

B. IMAGE PREPROCESSING:

In our process, we must resize the image and convert the image into Grayscale. To resize an image, you call the resize () method on it, passing in a two-integer tuple argument representing the width and height of the resized image. The function doesn't modify the used image; it instead returns another Image with the new dimensions. Convert an Image to Grayscale in Python Using the Conversion Formula and the matplotlib Library. We can also convert an image to grayscale using the standard RGB to grayscale conversion formula that is imgGray = 0.2989 * R + 0.5870 * G + 0.1140 * B

C. FEATURE EXTRACTION:

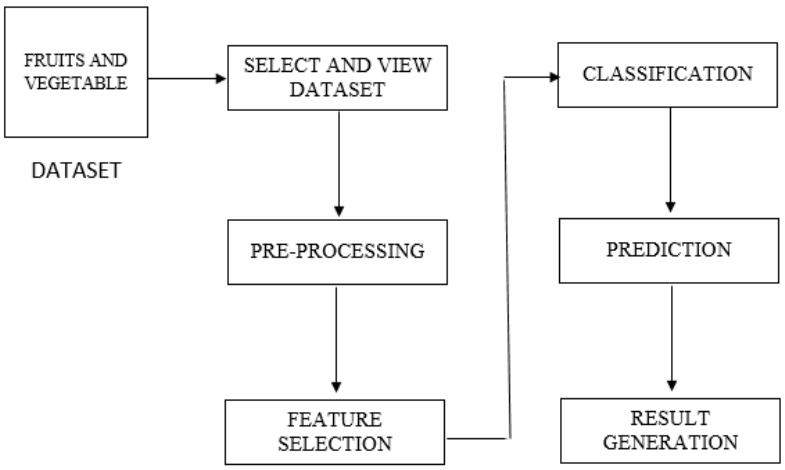
In our process, we must extract the features from pre-processed images. Feature extraction in Gray Level Co-occurrence Matrix (GLCM) analysis involves computing a set of statistical measures from the GLCM to characterize the texture properties of an image. These features provide valuable information about the spatial relationships between pixel intensity values and can be used for various image analysis tasks.

D. IMAGE SPLITTING:

During the machine learning process, data is needed so that learning can take place. In addition to the data required for training, test data are needed to evaluate the performance of the algorithm to see how well it works. In our process, we considered 70% of the input dataset to be the training data and the remaining 30% to be the testing data. Data splitting is the act of partitioning available data into two portions, usually for cross-validator purposes. One Portion of the data is used to develop a predictive model and the other to evaluate the model's performance. Separating data into training and testing sets is an important part of evaluating data mining models. Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing.

E. PREDICTION:

Utilizing a trained deep learning model to categorize unfamiliar data constitutes the process of prediction. Leveraging visual attributes, the model determines whether the fruit or vegetable falls into Grade A, B, or C. By analyzing features extracted during training, such as color, texture, and shape, the model makes informed decisions regarding the quality grade of the produce. This predictive capability enables automated sorting and classification systems to efficiently assess and categorize items based on predefined quality standards, facilitating streamlined processing and distribution in various industries, including agriculture and food production.



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F. RESULT:

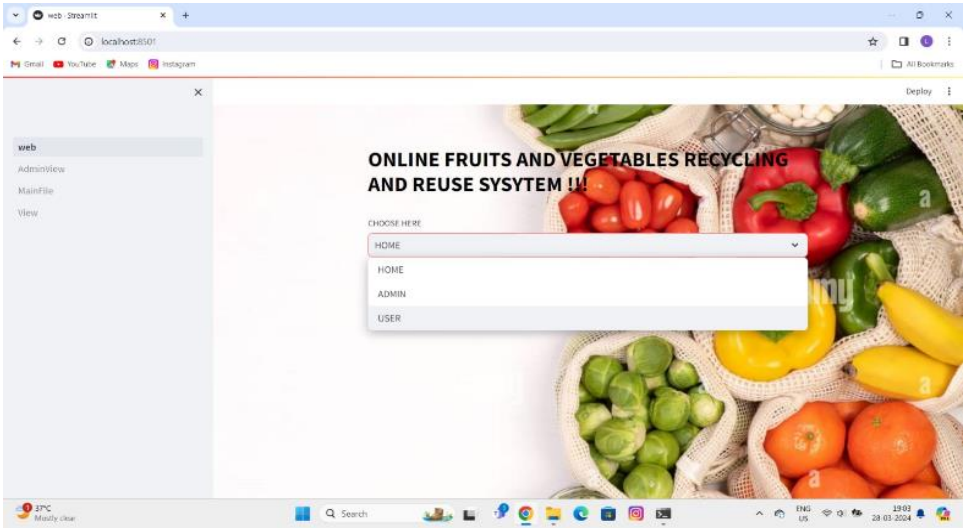

Fig. 1 Home Page

Fig. 2 Login Page

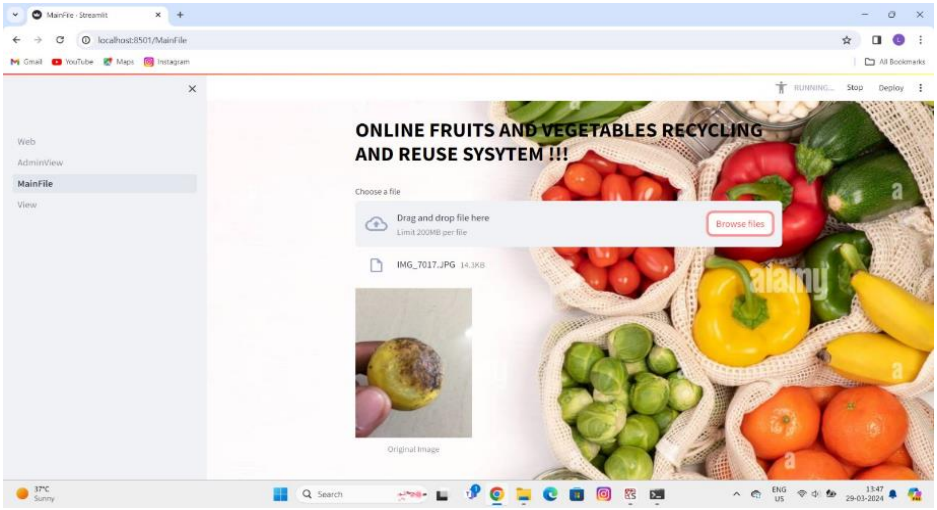

Fig. 3 Uploading a Fruit

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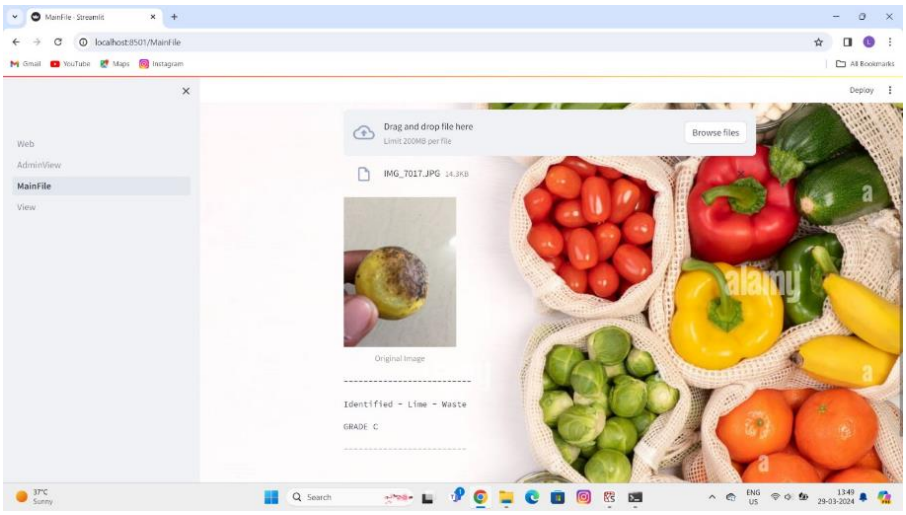

Fig. 4 Grade value for the Fruit

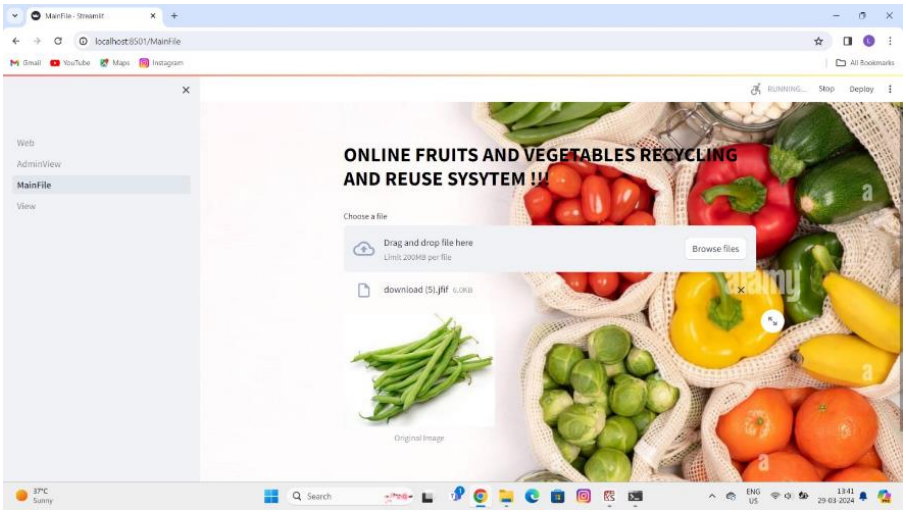

Fig. 5 Uploading a Vegetable

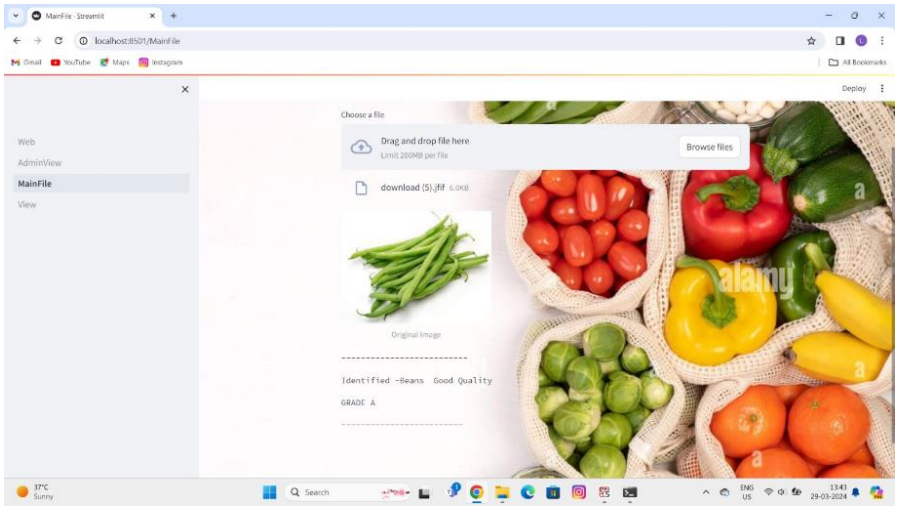

Fig. 6 Grade value for the Vegetable

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IV. CONCLUSION

In conclusion, the implementation of an online fruits and vegetables recycling and reuse system offers a promising solution to address several critical issues simultaneously. Throughout this project, we have explored the numerous benefits and practicalities of such a system, highlighting its potential to mitigate food waste, promote sustainability, and foster community engagement.

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