THE LITERATURE SURVEY ON INTRA CLASS FRUITS AND VEGETABLE RECOGNITION SYSTEM USING DEEP LEARNING

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ABSTRACT
Computer vision and pattern recognition is an emerging field in identifying objects in an image. Techniques for identifying objects in images have a wide range of applications such as vegetable and fruit detection systems, vehicle detection and other systems. Our research work focuses on detecting vegetable and fruit varieties in developing an efficient vegetable and fruit identification system. Vegetables may look similar by color and other characteristics, for example, red tomatoes and paprika as the same color, so using features to detect vegetables can lead to false identification, so this research proposes an intra-class vegetable and fruit identification system in which dark color is used. Deep learning is used to explore the range of vegetables and fruits by extracting and learning images and the convolution neural network (CNN). From the evaluation results, intra class vegetables and fruits were accurately recognized with 95.50% and intensive learning was used efficiently.

Keywords: Computer Vision, Recognition, Deep Learning, CNN.

I. INTRODUCTION
In the field of computer vision is to establish an effective system of recognition is a challenging Task. The principle part of the recognition system is to achieve a human level of awareness Theme. Vegetables can be from different functions, such as color, shape, form, texture, etc. Vegetables and fruits are recognized as using the combined features of an effective performance. Feel it again Plants, there are many complexities to be overcome, for example, vegetables can be the same color and shape of the vegetables and it can occur at a significant variety of shades and finishes, It depends on how they are coming up, i.e., tomato, green, yellow, see, this can be May cause false detection of the vegetables and reduce the error level. The color function is used to assess the quality of the software, to the sort of tomatoes, based on Development, and classification of Apple's disease. Results in various stages of Decay, Yes To determine the use of RGBD analysis. The texture features used to recognize fruits, vegetables, and And date. Color and texture features in combination, in order to recognize many types of fruits and vegetables found Green Apple is currently trying to classify the apples of the disease. In addition, by means of a centralized functions of the efficiency is not high And will lead to the wrong classification. Vegetables, which was recorded with the help of deep learning, it is better The restructuring of other features, such as color and texture. Vegetables are authenticated in real time with the help of The Internet of Things(IoT), and deep learning, which is useful plants shops. Deep learning Neural network is a precise method of characteristics and the predicted arrangements Desires of the hierarchy of the data is unlabeled and unstructured.

II. DEEP LEARNING
In-depth learning is an artificial intelligence that is part of how to learn by machine. Deep learning works like the human brain. The human brain consists of nerve cells known as neuron. Synapse acquires a neuron membrane, through them the sensors receive the signal. After signal detection neurons activate and transmit signal through the axon. Pattern identification and decision making are done by Signal changes. In-depth learning is part of a machine learning algorithm uses various layers to extract features from raw data. Deep learning has different architecture and they are

- Convolution neural network
- Artificial neural network
- K nearest neighbor
A. Convolution neural network

CNN is a deep learning algorithm. It can take in an input image, assign its importance (shape, color, edges, etc) to various objects in the image. They can able to differentiate one image from other image. CNN consists of 3 layers-

1. Convolution layer: Used to extract features from an input image. Here a 5*5 matrix is converted into 3*3 matrix (convolued feature) based on feature extraction.

![Convolution Layer](image1)

**Fig 1:** Convolution Layer

2. Pooling layer: This layer reduces the number of parameters or pixels when the images are too large. There are 3 types:
   - Max pooling: Takes the largest element from the feature matrix.
   - Average pooling: Takes the average number from the feature matrix.
   - Sum pooling: Takes the sum of numbers from the feature matrix.

![Pooling Layer](image2)

**Fig 2:** Pooling Layer

3. Fully connected layer: We will put our matrix into vector form and feed it into a fully connected layer like a neural network. Then we combine all the features together to create a model.

![Fully Connected Layer](image3)

**Fig 3:** Fully Connected Layer

B. Artificial neural network

- It is designed to simulate the way human brain analyses and processes information.
• Used to predict the output values for given input parameters from their training values.

![Artificial neural network diagram](image)

**Fig 4: Artificial neural network**

C. K nearest neighbor

- It is a simple, supervised, ML algorithm.
- Can be used to solve both classification and regression problems.
- Easy to implement and understand.

![K nearest neighbor diagram](image)

**Fig 5: K nearest neighbor**

- We can classify Alzheimer’s into different stages.
- Stores all the available data and classifies them based on similar features.

### III. PROPOSED SYSTEM

In the proposed system, the vegetables can be resolved with the help of the neural network (CNN) is a deep learn the methods of a class, as shown in Figure 6. When learning for the first the photos will be uploaded as well as the pre-processing due to its size, and to the standardization of the with the CNN figure. After the pre-processing is applied to a neural network model built with keras. In the picture the model is neural networks and the preparation of data with a batch size of 16, and sometimes up to 100. The available experimental data it is stored in an H5 file, which is a hierarchical data format. In addition to the key file that will be used in the validation of the data for class prediction for the vegetables and fruit, and finally, a class of vegetables and fruits that will become as expected.
Vegetables and fruits are recognized using a convolution neural network (CNN) by the method of deep learning class as shown in Figure 6. While training data, first images are read and preprocessed by resizing and normalizing the image. After preprocessing applying the convolution neural network model built using Keras. The convolution neural network model and train the data’s with batch size 16 and set the epochs to 100. The trained data are stored in the H5 file which is a hierarchical data format. Further trained data file used while testing data to predict the vegetable and fruit class and at last the class the vegetables and fruits will be predicted.

V. DATA SET

The vegetable and fruit dataset comprising 24 different categories with their intraclass 1) vegetables: black brinjal, green brinjal, purple brinjal, green cabbage, purple cabbage, green capsicum, red capsicum, yellow capsicum, baradari chili, green chili, red chili, green cucumber, white cucumber, Mangalore cucumber, colocasia, sweet potato, potato, red tomato, green tomato, onion, ginger, lemon, carrot, and coconut 2) fruits: apple, orange, grape, banana, watermelon, strawberry, mango, pineapple, papaya, apricot, plum, avocado, blueberry, peach, guava, kiwi, grapefruit, raspberry, jackfruit, pear, melon, cherry, black beery, green apple.
VI. EVALUATION RESULT

In the experiment, 24 categories of 3924 vegetables and fruits were used. Images of vegetables and fruits are divided into trials and training. In training 3210 and 714 image tests are used. Number of photographs used for testing and training. The system is trained using the convolution neural network (CNN) model as shown in Fig 1,2,3 in batch size 16 and is set to 100 epochs. Well-known vegetable and vegetable samples are used using experimental data. Almost all vegetables and fruits are seen in more than 90%. Compared to the rearrangement of vegetables and fruits using color and texture features, in-depth study achieves more accuracy. In total using intensive research, the recognition of vegetables and fruits is 95.50%. Compared to the results of the existing method of identifying vegetables and fruits the proposed method is more efficient and accurate. The combined characteristics of vegetables and fruits achieve 90% accuracy and the definition of vegetables and fruits is much higher than the proposed method and vegetables and fruits are obtained using the YOLO algorithm achieves 61.6% accuracy compared to the proposed method as shown in Fig 9. Then our proposed method works well and accurate compared to the current system with 95.50% accuracy.

![Image](image_url)

Fig 9: Comparison of methods

VII. CONCLUSION

In this research project, you see the vegetable category we use in-depth reading framework. Under 24 categories of vegetables, image data used for testing. From the test result, to see vegetables use deeper studying structures by examining neural convolution network (CNN) is better than using features like color as well texture. Vegetables are clearly and accurately identified. In future work, vegetable recognition can be done individually deep learning methods such as deep neural network (DNN) and deep belief network (DBN). Vegetable recognition improved by using it in real time using the cameras of shops.

VIII. REFERENCES
