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Project Report about *Classification of Fruits and Vegetables*

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SECTION: 8BM

Classification of Fruits and Vegetables

Abstract: When it comes to dietary assessment and advice, fruit and vegetable classifications that are based on their content are the most beneficial. This study examined the relationship between fruit and vegetable levels of food components and the botanic family, color, plant part, and total antioxidant capacity (TAC) classification criteria. Based on dietary component levels and the categorization criteria, the foods were grouped into homogeneous clusters using a mathematical clustering technique. The botanic families of rose, rue (citrus), amaryllis, goosefoot, and legume; color groups of blue/black, dark green/green, orange/peach, and red/purple; and plant parts of fruit—berry, seeds or pods, and leaves—were the most helpful in terms of classification. Often, a combination of classification factors, such as color and plant component, best described clusters.

Introduction: Fruits and vegetables include phytochemicals that may reduce the risk of chronic disease, making them valuable sources of certain necessary elements for human health. Researcher classification

of fruits and vegetables is crucial for evaluating the connections between nutrition, health, and illness. For instance, in order to evaluate intakes of particular food components, researchers that create meal frequency questionnaires frequently need to measure their fruit and vegetable questions. In order to help people choose the right kinds of fruits and vegetables to suit their nutrient and health demands, dietary advising materials requiring fruit and vegetable classification are also necessary. Food guides are available in many countries and provide recommendations for intake as well as graphical representations of the food groups and subgroups. Because the focus of food guidelines is not only on the key components of fruits and vegetables but also on which fruits and vegetables are generally available to and consumed bypopulation groups, the fruit and vegetable groupings and subgroups differ from one country to the next.

Related Work : We used Convolutional Neural Network(CNN) for image classification and recognition in out project. There are many fruit and vegetable classification project in which different methods are used. They used Residual Networks, Dense Convolutional Network, Visual Geomerty Group Network, Capsule Network etc. Those Neural Network are similar to CNN. But there are simple difference in efficiency. However CNN is the most reliable neural network for classification and recognition problem which we implemented in our project.

Dataset and Features : We took our data set from Kaggle.

Dataset Link : https://www.kaggle.com/datasets/kritikseth/fruit-and-vegetable-image-recognition

In our dataset there are 36 directories containing different fruits and vegetables in each folder. In each fruits or vegetables folder there are varieties of pictures of that fruit or vegetable. Pictures from different angle, half eaten, different colors, animated pictures are available in every folder. And all these folder are contained in test, train and validation folder.

Methodology:

1) Fruits Data Collection : Gather a diverse dataset of fruit images. These images should cover various types of fruits, different angles, lighting conditions, and backgrounds.

2) Fruits Data Preprocessing : Resize all images to a uniform size to ensure consistency.

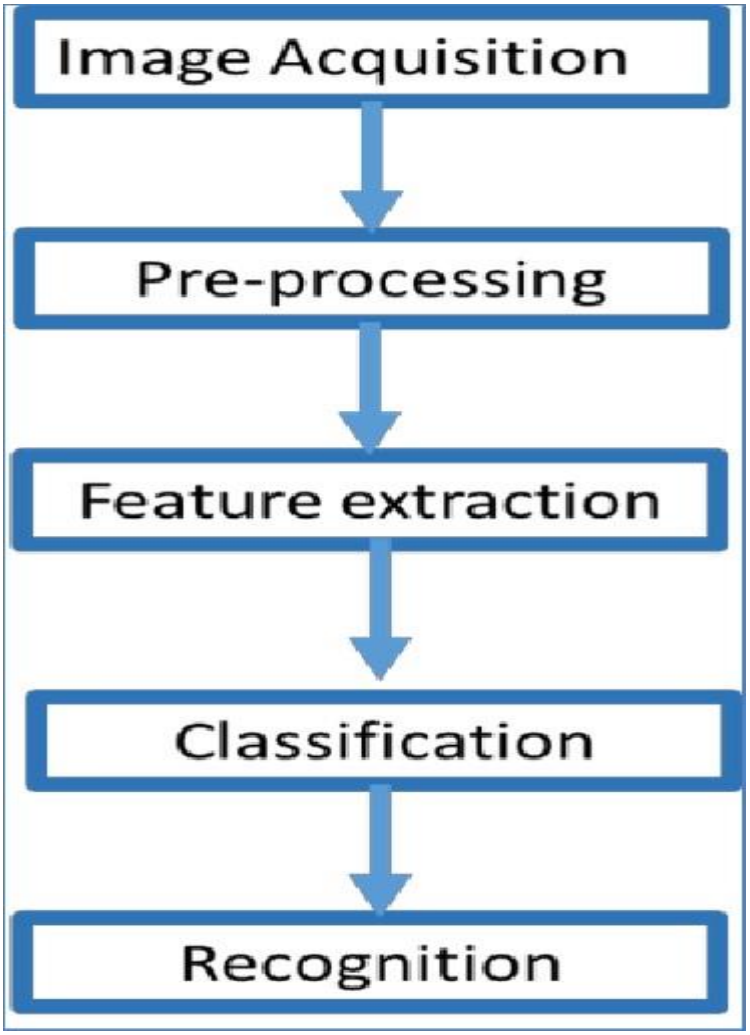
3) Feature Extraction or Deep Learning : Extract relevant features from the images using techniques like Histogram of Oriented Gradients (HOG), Local Binary Patterns (LBP), or color histograms.

4) Model Training : Split the dataset into training, validation, and testing sets. Train a machine learning model (e.g., SVM, Random Forest, kNearest Neighbors) or a deep learning model (e.g., CNN) on the training data.

5) Model Evaluation : Evaluate the trained model on the testing set to assess its performance metrics such as accuracy, precision, recall, and F1-

score.

6) Model Deployment : Once satisfied with the model's performance, Provide an interface (e.g., web application, API) for users to upload images and receive predictions about the fruit type.



Fruit and vegetable recognition system images Methodology

Results:

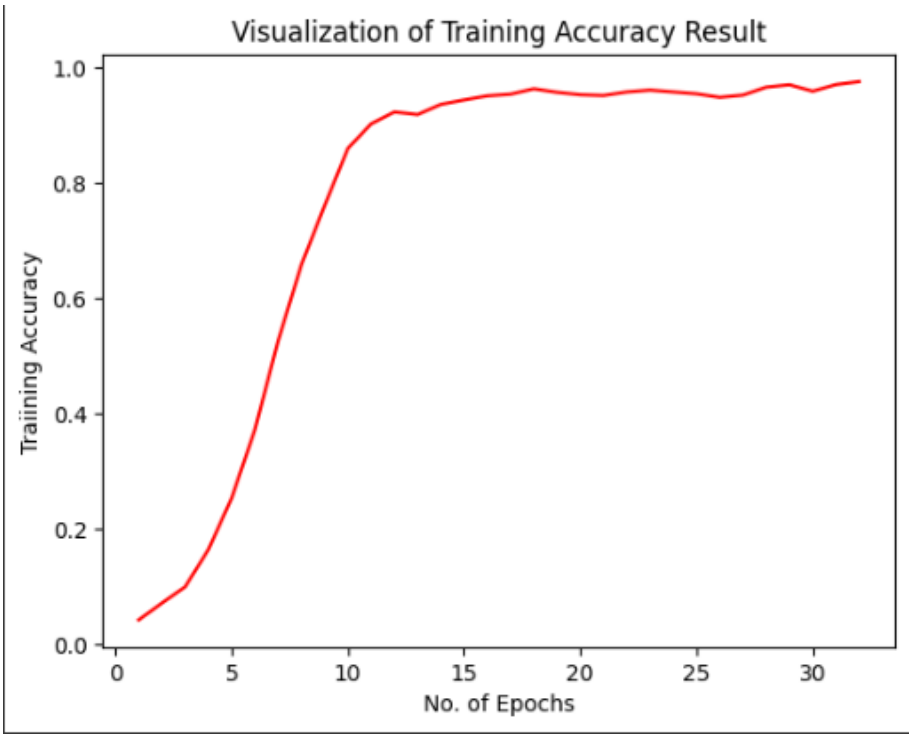


Fig: Training accuracy visualization

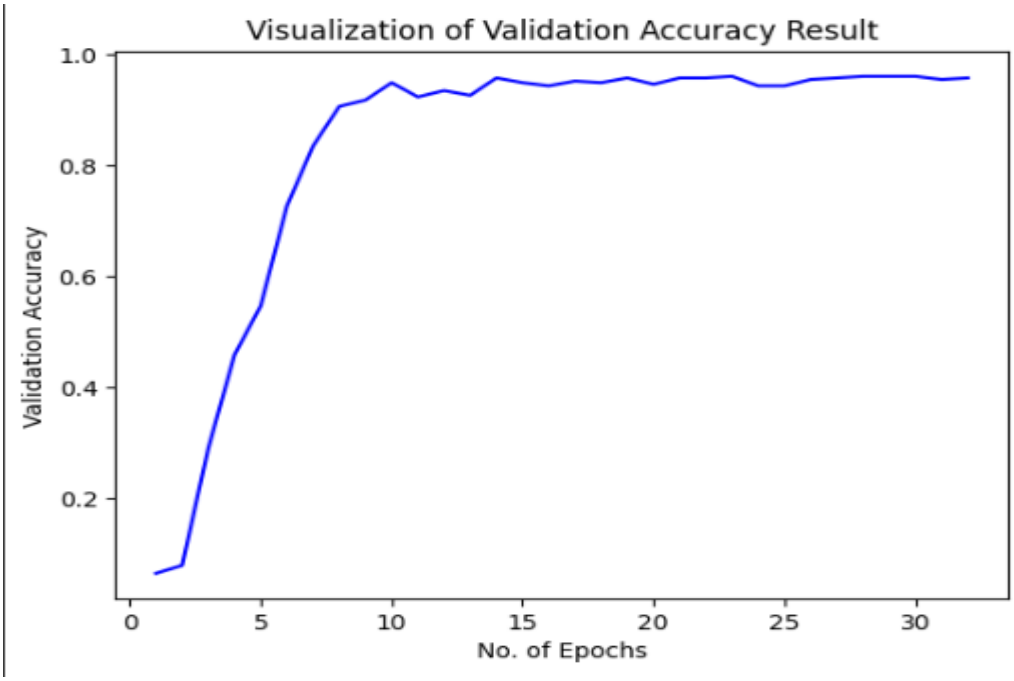


Fig: Validation accuracy visualization

Accuracy: The final test accuracy is : 95.82%

Conclusion or Future Work : We also have future plane with this project. In future we will add voice recognition system in our project. With the help of this system blind people can also recognize their desired fruits and vegetables.

Contribution : Three members of our group contributed in this project.We used Google Colab for Training and Testing our project and Streamlit for web implementation.

Mohammad Kamrul Hasan (C193072) : Trained the project model.

Miraj Uddin Chowdhury (C201074) : Tested the project model.

Munir Uddin Rohan (C201066) : Implemented the Web Page.

Reference : We took help from stackoverflow, quora, geeksforgeeks website to complete our project.

Link 01 : https://www.geeksforgeeks.org/introduction-convolution-neural-network/

Link 02 : https://stackoverflow.com/questions/66659132/deep-learning-cnn-model-not-learning

And so on