MACHINE LEARNING (C2312)
COURSE PROJECT

Develop a model to classify pomegranates affected by diseases based on the fruit- dataset

TEAM MEMBERS

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INTRODUCTION

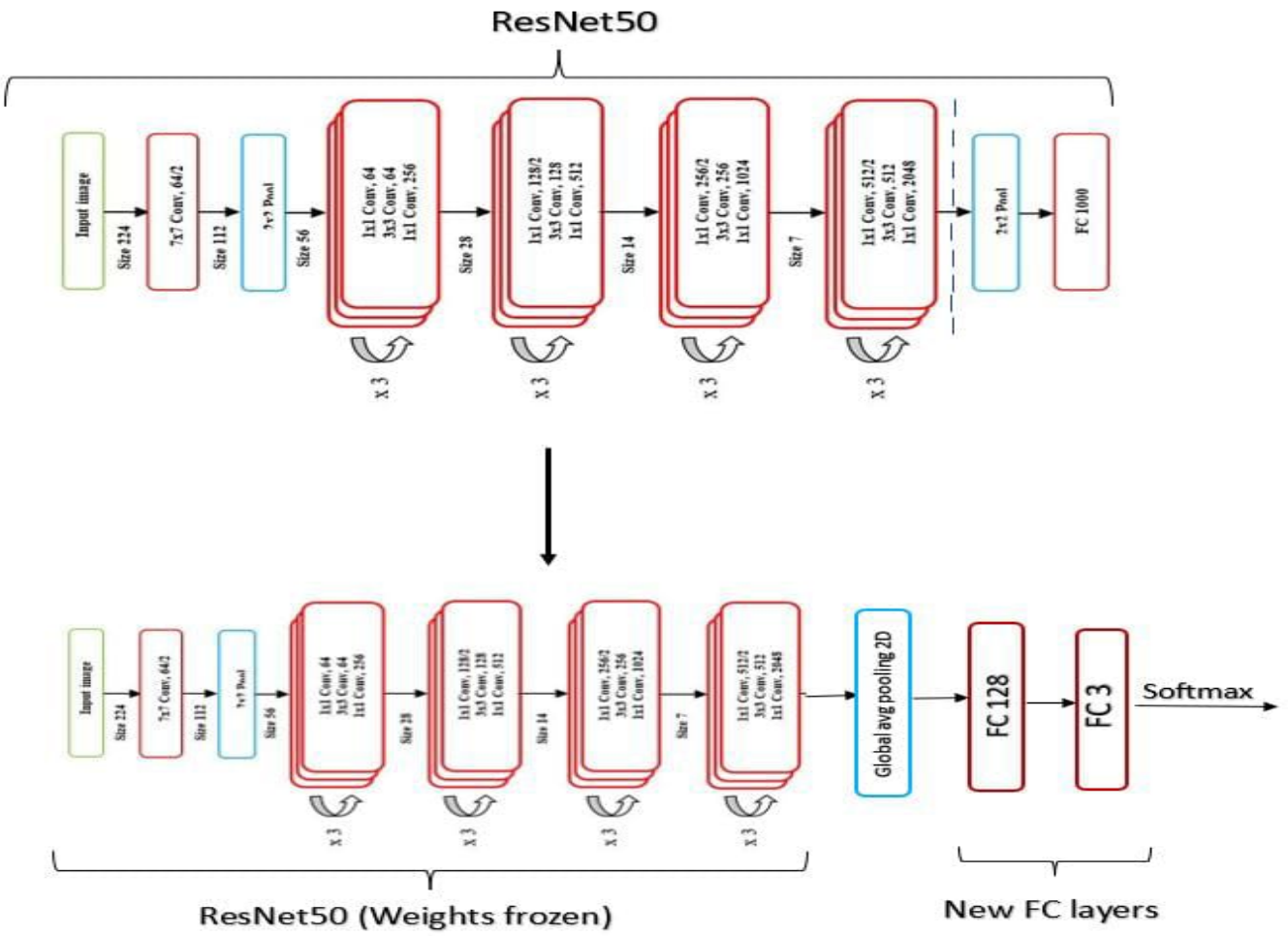
The given dataset consists of 419 images of pomegranates belonging to three classes. One of the classes has healthy samples of pomegranates. The other two classes have samples of diseased pomegranate, one belonging to bacterial disease and the other to fungal. The aim of the project is to develop a machine-learning model that can accurately classify pomegranate images into their respective categories based on their health conditions.

The development of a robust and accurate classification model will contribute to sustainable agriculture practices and assist farmers in making informed decisions for disease control measures.

DATA PREPROCESSING :

The given images from the dataset were stored in an np array ‘images’ and their corresponding labels were stored in the array ‘labels’. The classes ‘Healthy’, ‘Bacterial’, and ‘Fungal’ were given labels 0, 1, and 2 respectively. The labels were converted to a one-hot encoding format. The dataset was then split into train and test sets with test data of 10 %.
The train and test images were also preprocessed to ensure compatibility with ResNet50.

ARCHITECTURE: CNN with transfer learning from ResNet50



Architecture :

1. ResNet50 was used as a base model with its fully connected layers excluded. The weights obtained by training ResNet50 on the imagenet dataset were frozen and transferred to our model.

2. GlobalAveragePooling2D: reduces the spatial dimensions of the features to a column vector of fixed length. It calculates the average value of each feature map and flattens in feature maps.

3. Fully connected layer (128 neurons): activation function = ReLU, L2 regularization to reduce overfitting.

4. Dropout Layer with 50% neurons dropout in each iteration to minimize overfitting.

5. Output Layer : 3 neurons for classification into 3 classes. Activation function = softmax (For multiclass classification).

Model Compiling

Optimization Algorithm = Adam
Loss Function = categorical cross entropy
Metrics = Accuracy

Model Performance

Train accuracy = 99%
Test accuracy = 97%

Model Performance on only images with Background

The ‘Fungal’ and ‘Healthy’ classes of the given dataset had some images with background and some images without background. The above model created the test dataset randomly. To analyze whether the model considered the presence of background as a feature of the class, the model was again tested on a test dataset having only the images with backgrounds. The test accuracy dropped to 95%. This shows that the model assumes the presence of background as a feature of the class. But since the difference in accuracy is not too much, the background is not considered a major feature in determining the class.

CONCLUSION

The developed model gives almost similar accuracy on both training and test datasets and accurately classifies the images of pomegranates into the correct classes.

NotebookLink:
https://www.kaggle.com/code/mahatikalale/fruitsresnet/notebook