- **Implementation of Deep Learning Methods to Identify Rotten Fruits**
  (Link: https://ieeexplore.ieee.org/abstract/document/9453004)

Summary
In the agricultural segment, identifying fresh and rotten fruit is essential since rotten fruits not only cause health deterioration but also fresh fruits can be affected by the rotten ones. Therefore, in this paper, the authors proposed a model to prevent the propagation of rottenness including an integrated system proposal for increasing productivity and reducing human efforts, manufacturing cost and time. Here , they have tested on three types of fruits: apples, bananas and oranges. Later on, using the Convolutional Neural Network and some other image processing methods, then training the machine on a Kaggle dataset for achieving the highest accuracy rate as 99.46%. Another research area of this paper is on CNN model for detecting fresh and rotten fruits.

Methodology
In this research, they have used some methods of image processing with machine learning techniques. First of all, they trained the machine using the Kaggle dataset. Then using Convolutional Neural Network for collecting features of input fruits, image categorizing with Max Pooling, Average pooling and MobileNetV2. For detection and differentiation between fresh and rotten fruits, CNN (Convolutional Neural Network) method is implemented here.

Equations
The following formulas are used here,

$$Precision = \frac{TP}{TP+FP}$$

$$Recall = \frac{TP}{TP+FN}$$

$$Accuracy = \frac{TP+TN}{TP+FP+TN+FN}$$

$$F1 - Score = \frac{Recall*Precision}{Recall+Precision}$$

Findings

Here they find out some accuracy rate and validation rate using CNN, MobileNetV2 and max pooling.

Novelty

The novelty of this paper is they integrated an architecture using both Convolutional Neural Network and Max pooling with MobileNetV2 for detecting rottenness of fruit.

Algorithm Used

Stochastic gradient descent algorithm and KNN clustering algorithm is used here.

Analysis

If deep CNN and Max pooling methods are applied simultaneously, then the highest accuracy rate of training data is 94.49% and validation set is 94.97%. After applying MobileNetV2, the validation accuracy reached 99.61%.

Research Gap

They only proposed an architecture for CNN using Max pooling but there is no architecture described for MobileNetV2 and CNN.

Problems Faced

The components used for this research are not clearly given here.

Future Work

In future, there is a chance of combining both Convolutional Neural Network and MobileNetV2 for better accuracy rate since MobileNetV2 has higher accuracy rate than Mix.