

Detection of Adulteration in Fruits and Vegetables using Deep Learning

Thejaswini R S

Student, Department of Master of Computer Application
Vidya Vikas Institute of Engineering and Technology, Mysuru, India

Abstract: Food adulteration and poor produce quality remain pressing global concerns, directly impacting consumer health and food safety. Fruits and vegetables are often treated with artificial coatings, dyes, and surface chemicals to enhance their appearance and shelf life. Such adulteration practices, while visually appealing, can introduce harmful substances into the food chain. To address this issue, the proposed study presents an intelligent, automated system for quality and safety assessment of fruits and vegetables using deep learning and advanced image processing techniques. The system leverages two publicly available datasets—Fruits Detection and Quality Analysis, and Vegetable Quality Detection—comprising authentic and adulterated samples. Image preprocessing steps such as binarization, adaptive thresholding, grayscale conversion, and watershed segmentation are applied to enhance contrast, isolate regions of interest, and improve feature extraction. The processed images are then analyzed using a VGG16-based Convolutional Neural Network (CNN) model fine-tuned through transfer learning to detect adulteration and evaluate surface quality. Based on the classification results, the system further performs a safety assessment, categorizing produce as safe or unsafe for consumption. This dual-layered approach ensures both visual quality grading and health-oriented safety prediction. Experimental results demonstrate that the model achieves high accuracy and robust generalization across varied lighting and texture conditions. The proposed system provides a rapid, non-invasive, and reliable solution for real-time food quality monitoring, aiding consumers, vendors, and regulatory authorities in ensuring safer and more transparent food distribution.

Keywords: Food Adulteration, Image Processing, Deep Learning, VGG16, Fruit and Vegetable Quality Detection, Safety Assessment, Transfer Learning

