

Title: Computer vision based deep learning approach for toxic and harmful substances detection in fruits

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Abstract: Formaldehyde (CH₂O) is one of the significant chemicals mixed with different perishable fruits in Bangladesh. The fruits are artificially preserved for extended periods by dishonest vendors using this dangerous chemical. Such substances are complicated to detect in appearance. Hence, a reliable and robust detection technique is required. To overcome this challenge and address the issue, we introduce comprehensive deep learning-based techniques for detecting toxic substances. Four different types of fruits, both in fresh and chemically mixed conditions, are used in this experiment. We have applied diverse data augmentation techniques to enlarge the dataset. The performance of four different pre-trained deep learning models was then assessed, and a brand-new model named “DurbeenNet,” created especially for this task, was presented. The primary objective was to gauge the efficacy of our proposed model compared to well-established deep learning architectures. Our assessment centered on the models' accuracy in detecting toxic substances. According to our research, GoogleNet detected toxic substances with an accuracy rate of 85.53 %, VGG-16 with an accuracy rate of 87.44 %, DenseNet with an impressive accuracy rate of 90.37 %, and ResNet50 with an accuracy rate of 91.66 %. Notably, the proposed model, DurbeenNet, outshone all other models, boasting an impressive accuracy rate of 96.71 % in detecting toxic substances among the sample fruits.

Keywords: Toxic substance Harmful substances Chemical mixed Formalin detection Computer vision Deep learning K-fold DurbeenNet

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