SMART SORTING : TRANSFER LEARNING FOR IDENTIFYING ROTTEN FRUITS AND VEGETABLES

DATE	20-02-2026
TEAM ID	LTVIP2026TMIDS90622
PROJECT NAME	SMART SORTING : TRANSFER LEARNING FOR IDENTIFYING ROTTEN FRUITS AND VEGETABLES
MAXIMUM MARKS	5 MARKS

4.2 PROPOSED SOLUTION

The proposed solution is an intelligent image-based classification system that automatically detects and separates fresh and rotten fruits and vegetables using transfer learning. The system leverages pre-trained deep learning models to accurately identify spoilage patterns such as discoloration, mold growth, texture deformation, and surface damage. This approach reduces food wastage, improves quality control, and minimizes manual inspection errors in markets, supermarkets, warehouses, and food processing units.

The core idea is to use a pre-trained Convolutional Neural Network model such as MobileNetV2, ResNet50, or VGG16 trained on large-scale datasets like ImageNet. These models already understand general image features such as edges, textures, and shapes. We fine-tune them on a custom dataset containing labeled images of fresh and rotten fruits and vegetables. By retraining only the final layers, the system adapts to the specific classification problem while requiring less data and computational power.

The solution architecture consists of four main components. First, image acquisition using a camera or mobile device captures fruit and vegetable images in real time. Second, image preprocessing techniques such as resizing, normalization, noise reduction, and augmentation improve image quality and model robustness. Third, the transfer learning model performs feature extraction and classification into categories such as fresh apple, rotten apple, fresh tomato, rotten tomato, and so on. Finally, the prediction output triggers an action, such as displaying the result on a dashboard or activating an automated sorting mechanism.

After training, the model is deployed as a web or mobile application. The front end allows users to upload or capture images, while the backend processes the image and returns the classification result. For industrial implementation, the system can be integrated with IoT-based conveyor belts where a camera continuously captures images and the model controls mechanical arms to separate rotten items automatically.

The proposed solution offers multiple advantages. It reduces dependency on manual inspection, improves accuracy and consistency, operates in real time, and is scalable for different types of produce. Since transfer learning uses pre-trained models, it significantly reduces training time and computational cost compared to building a model from scratch.