**Problem Statement**

| Field | Details |
| --- | --- |
| Date | 16-06-2025 |
| Team ID | LTVIP2025TMID35102 |
| Project Name | Smart Sorting: Detecting Rotten Fruits with Transfer Learning |
| Maximum Marks | 2 Marks |

In today’s fast-paced agricultural and retail environments, stakeholders face increasing challenges in ensuring the freshness and quality of fruits and vegetables. With rising consumer expectations, strict food safety standards, and mounting pressure to reduce post-harvest losses, the need for rapid and accurate quality assessment has never been more critical. Traditional methods of fruit sorting depend heavily on manual inspection, which is time-consuming, subjective, and error-prone—often leading to the sale of spoiled items, customer dissatisfaction, and wastage of resources.

Farmers, vendors, cold storage operators, and food distributors frequently struggle to answer crucial questions such as:  
• How can we quickly and reliably identify rotten fruits from fresh ones at scale?  
• Can we automate the sorting process to reduce human error and save time?  
• Is there a low-cost, accessible solution that doesn’t require expensive hardware?  
• How can we improve food quality control while minimizing wastage and losses?  
• Can image-based technology help us detect spoilage before it becomes visible to the human eye?

Moreover, small-scale vendors and distributors often lack access to advanced inspection equipment or technical expertise, limiting their ability to implement automated quality control systems. Existing solutions are either too costly or too complex for real-world deployment in small farms, street markets, or decentralized supply chains.

To address these critical challenges, this project proposes a machine learning-based solution leveraging **transfer learning** to classify fruits as **fresh or rotten** using image inputs. By using a pre-trained convolutional neural network (CNN) such as **VGG16**, the system is fine-tuned on a custom dataset of fruits and vegetables to achieve high-accuracy predictions with minimal training data and resource usage.

The Smart Sorting system aims to:  
• Provide an accurate and efficient image classification model to distinguish rotten fruits from fresh ones.  
• Minimize dependence on manual labor and inconsistent human judgment in the sorting process.  
• Empower farmers, vendors, and storage handlers with a practical, lightweight, and cost-effective quality control tool.  
• Reduce post-harvest losses and improve overall supply chain efficiency by catching spoilage early.  
• Enhance trust and customer satisfaction by ensuring better quality produce reaches consumers.

By transforming the fruit-sorting process through transfer learning and image classification, this project bridges the gap between AI research and real-world impact — enabling smarter, faster, and more reliable sorting that supports small-scale stakeholders in the food supply chain.