Project Design Phase
Proposed Solution Template

Date	29 Jun 2025
Team ID	LTVIP2025TMID36983
Project Name	Small sorting: Transfer learning for identifying rotten in fruits and vegetables
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The manual identification of rotten fruits and vegetables is labor-intensive, time-consuming, prone to human error, and subjective, leading to significant post-harvest losses and reduced consumer satisfaction. Contaminated produce can also spoil healthy batches, resulting in further economic losses. An automated, efficient, and accurate system is needed to reliably distinguish between fresh and rotten produce.
2.	Idea / Solution description	Our solution proposes a small-scale, automated sorting system utilizing computer vision and transfer learning to identify rotten fruits and vegetables. We will leverage pre-trained Convolutional Neural Networks (CNNs) (e.g., MobileNetV2, ResNet, VGG) that have learned rich feature representations from large image datasets. These models will be fine-tuned on a custom dataset of fresh and rotten fruits/vegetables to adapt their learned features to this specific classification task. The system will capture images of produce, process them through the fine-tuned model, and classify them as "fresh" or "rotten," enabling automated sorting.
3.	Novelty / Uniqueness	The novelty lies in the application of transfer learning to create a highly accurate and efficient "small sorting" solution for diverse fruits and vegetables, which can be deployed in a localized, cost-effective manner (e.g., at farm gates, small distribution centers, or even household level). Unlike large-scale industrial sorters, this solution focuses on accessibility and ease of implementation for smaller producers or consumers, potentially using compact, off-the-shelf hardware. The use of lightweight pre-trained models (like MobileNet)

		will ensure computational efficiency suitable for embedded systems.
4.	Social Impact / Customer Satisfaction	**Social Impact:** This solution will significantly reduce food waste by enabling timely removal of rotten produce, thus conserving resources and contributing to food security. It can also empower small farmers and vendors to maintain higher quality standards, leading to better market prices and reduced financial losses. **Customer Satisfaction:** Consumers will benefit from receiving consistently fresh and safe produce, leading to increased trust and satisfaction with suppliers. It also reduces health risks associated with consuming spoiled food.
5.	Business Model (Revenue Model)	The business model can involve selling the small sorting hardware units (e.g., a camera module integrated with a processing unit and sorting mechanism) to farmers, small businesses, and even households. Additionally, a subscription-based service could be offered for software updates, model improvements (e.g., adding new fruit/vegetable types), and cloud-based data analytics (e.g., tracking spoilage rates). Partnerships with agricultural co-ops or food distributors could also be explored for wider adoption.
6.	Scalability of the Solution	The solution is highly scalable. The core transfer learning model can be easily adapted to classify new types of fruits and vegetables by fine-tuning with additional data. The "small sorting" unit design can be replicated and deployed in numerous locations without significant infrastructure overhaul. For larger operations, multiple small units can work in parallel, or the underlying AI model can be scaled up to handle higher throughput industrial sorting systems with more robust hardware. The cloud-based model updates ensure easy distribution of improvements across all deployed units.