

Project Design Phase

Problem – Solution Fit Template

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| Date | 27 June 2025 |
| Team ID | LTVIP2025TMID41476 |
| Project Name | Smart Sorting: Transfer Learning for Identifying rotten fruits and vegetables |
| Maximum Marks | 2 Marks |

Problem – Solution Fit Template:

1. Problem:

In the agricultural and food supply chain, identifying and sorting rotten fruits and vegetables remains a major challenge. Manual inspection is time-consuming, labor-intensive, and prone to human error, leading to inefficiencies in quality control. Moreover, the lack of scalable and automated solutions results in food waste, increased operational costs, and compromised customer satisfaction across factories, supermarkets, and households.

2. Target Group / Customers:

- Food processing industries
- Supermarket quality control teams
- Tech-savvy consumers using smart kitchen appliances
- Agri-tech solution providers

3. Existing Alternatives:

- Manual sorting of produce by workers in processing plants
- Visual inspections by supermarket staff at receiving docks
- Expiry-date tracking in smart refrigerators
- Basic rule-based computer vision tools

4. Problems With Existing Alternatives:

- Inaccuracy due to human fatigue and inconsistency
- Lack of real-time detection and automated sorting
- Spoilage detection not based on actual visual condition
- Not scalable or adaptable to different produce types

5. Solution:

An AI-powered smart sorting system using transfer learning (based on pre-trained models like VGG16) that detects rotten fruits and vegetables through real-time image classification. The system can be integrated into conveyor belts, supermarket intake docks, or smart refrigerators. It classifies produce as fresh or rotten and enables automated sorting, alerting, or discarding — thereby reducing waste, improving efficiency, and enhancing freshness assurance.

Purpose:

1. **Automate Quality Control:** Eliminate manual inspection with intelligent image-based detection.
2. **Enhance Sorting Accuracy:** Use transfer learning models to reliably distinguish rotten produce.
3. **Minimize Food Waste:** Detect spoilage early across industrial and domestic environments.
4. **Support Retail Freshness:** Improve inventory decisions in supermarkets through real-time feedback.
5. **Promote Smart Living:** Enable households to monitor stored produce and act before spoilage.
6. **Scalable AI Integration:** Provide a flexible, low-cost solution adaptable to various settings and produce types.

Problem-Solution Fit:

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| Problem-Solution Fit Canvas | | |
| Define CS, fit into CL | 1. CUSTOMER SEGMENT(S) CS Food processing plant managers Supermarket supply chain/quality managers Smart home appliance users (tech-savvy households) | 6. CUSTOMER LIMITATIONS CL <small>EG, BUDGET, DEVICES</small> Budget limitations for new technology adoption Resistance to replacing existing systems or labor Lack of technical expertise for setup/maintenance |
| | 5. AVAILABLE SOLUTIONS AS <small>PROS & CONS</small> Manual inspection and sorting by workers pros: Human judgement, s, adaptable cons: Time consuming, inconsistent, fatigue-induced errors | 7. BEHAVIOR BE <small>+ ITS INTENSITY</small> Direct Actions: Hiring staff to sort manually Conducting regular visual inspections Indirect Actions: Training staff on spotting spoilage Investing in better packaging/storage for freshness |
| Focus on PR, tap into BE, understand RC | 2. PROBLEMS / PAINS PR <small>+ ITS FREQUENCY</small> Accurately identify and sort rotten fruits/vegetables Reduce manual labor and human error in sorting processes Maintain freshness and quality of produce before consumer delivery | 9. PROBLEM ROOT / CAUSE RC Manual inspection methods are inefficient and unreliable at scale Existing technologies are not specialized or trained for diverse spoilage patterns Lack of real-time feedback leads to delays in spoilage detection and action |
| | 3. TRIGGERS TO ACT TR Increase in complaints due to spoiled food reaching shelves High labor costs and inefficiencies in processing units | 10. YOUR SOLUTION SL Smart Sorting leverages transfer learning with deep learning models (e.g., VGG16) to automate the identification of rotten fruits and vegetables. It processes image data in real-time from cameras (in factories, supermarkets, or smart homes), classifies produce as fresh or rotten, and triggers appropriate actions like sorting, alerting, or discarding. |
| Identify strong TR & EM | 4. EMOTIONS EM <small>BEFORE / AFTER</small> Before: Frustrated, stressed, overwhelmed, worried about quality control and waste After: Relieved, in control, efficient, confident in consistent quality delivery | 8. CHANNELS of BEHAVIOR CH ONLINE Searching for automation/AI solutions in agriculture OFFLINE Visiting trade shows or expos for smart agriculture |
| | | Extract online & offline CH of BE |