**Emphathy Map**

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

The **Empathy Map Canvas** is used to deeply understand the needs, behaviors, thoughts, and pain points of people who would benefit from our Smart Sorting solution. By identifying what our end users feel, say, do, and think, we can craft a machine learning model that is meaningful, user-centric, and practically deployable in agricultural and retail environments.

**Who are we empathizing with?**

**• Farmers, Fruit Vendors, and Market Workers:**  
These users handle fresh produce in large quantities every day. They are responsible for sorting and selling fruits but often lack access to affordable automated tools. Their sorting process is mostly manual and relies on experience, which can lead to oversight or inconsistency.

**• Cold Storage Managers and Food Distributors:**  
These stakeholders deal with bulk storage and need efficient ways to inspect fruit quality before distribution. Their primary concerns include maintaining quality, reducing spoilage, and ensuring customer satisfaction. They seek fast, accurate, and low-effort solutions.

**User Says (What the user verbalizes)**

• “It's difficult to identify spoiled fruits when they're only slightly rotten.”  
Implication: Users are aware of the limitations of visual inspection and are looking for more reliable tools that can catch spoilage early.

• “Sorting takes too long, especially when we’re busy with customers.”  
Implication: They want solutions that reduce manual labor and save time during peak hours or harvest seasons.

**User Thinks (What the user is pondering, but not necessarily verbalizing)**

• “There has to be a smarter way to do this using technology.”  
Implication: They’re open to innovation but may not be confident about how to adopt it. There’s curiosity and willingness to explore automated options.

• “If I could just take a photo and get an answer, that would be perfect.”  
Implication: They value speed and simplicity, and prefer systems that don’t require technical skills.

**User Does (What actions the user takes)**

• Visually examines each fruit manually before selling or storing it.  
Implication: This is time-consuming and unreliable, especially with large quantities. Some spoiled items may slip through, causing losses.

• Sorts fruits into ‘good’ and ‘bad’ piles based on experience.  
Implication: While efficient, this method lacks consistency and cannot always detect early-stage rot or mold.

**User Feels (What emotions the user experiences)**

• Frustrated by frequent spoilage and complaints from buyers.  
Implication: They feel helpless when spoiled fruits are missed, damaging trust with customers and increasing waste.

• Pressured to maintain quality under time constraints.  
Implication: They need tools that reduce the mental and physical strain of fast-paced manual sorting.

**Insights Gained**

**1. Strong Demand for Visual, AI-based Sorting Systems**

**Insight:** Users want a camera-based solution that can classify fruits instantly.  
**Solution Impact:** Our transfer learning model, trained to identify fresh vs rotten fruits, directly addresses this need and can be deployed in a lightweight app or desktop interface.

**2. Ease of Use is Essential for Adoption**

**Insight:** Users are mostly non-technical. Complex systems will discourage usage.  
**Solution Impact:** The classification system should offer a simple drag-and-drop or upload mechanism, with the result clearly displayed — no installation, no commands, no code.

**3. Accuracy Builds Confidence**

**Insight:** Users are more likely to trust the system if it consistently gives the right result and explains it.  
**Solution Impact:** We include a confidence score (e.g., 95% Rotten) and sample output visuals to help users verify predictions.

**4. Real-time Results Improve Workflow Efficiency**

**Insight:** Time is limited, especially during sales or peak harvest. Delayed systems are not usable in real life.  
**Solution Impact:** The model’s inference time is under 3 seconds, enabling real-time decisions and sorting support.

**5. Affordability and Accessibility Drive Usage**

**Insight:** Many users work with limited budgets and basic devices.  
**Solution Impact:** The model is light, doesn’t require GPU, and can be run on basic laptops or integrated into low-cost apps — making it practical for wide adoption.

**Customer Problem Statement: Smart Sorting using Transfer Learning**

Problem statements help clarify real-world challenges, define our solution boundaries, and ensure our ML system solves a real pain point. We used the following template:

**Problem Statement 1: Difficulty in Accurately and Quickly Identifying Rotten Fruits**

We believe that fruit vendors, farmers, and cold storage workers are struggling to identify rotten fruits at scale because they rely on manual inspection and subjective judgment. This causes frequent spoilage, reduced profits, and customer dissatisfaction.

**Elaboration:**  
• **Customer Type:** Vendors, farmers, warehouse sorters  
• **Core Problem:** Slow, inconsistent, and labor-intensive fruit sorting  
• **Root Causes:**

* Human error in visual inspection
* Lack of affordable automated tools  
  • **Negative Impacts:**
* Increased food waste and cost
* Poor buyer experience

**Problem Statement 2: Inability to Detect Early-stage Spoilage Without Specialized Equipment**

We believe that many retailers and vendors cannot detect mold or soft rot in early stages because they don’t have tools for microscopic or biochemical analysis. This causes unhealthy fruits to be sold and brand reputation damage.

**Elaboration:**  
• **Customer Type:** Cold storages, local shopkeepers  
• **Core Problem:** Inability to detect less-visible spoilage  
• **Root Causes:**

* Absence of advanced tools
* Dependence on surface-level judgment  
  • **Negative Impacts:**
* Health risks
* Customer complaints

**Problem Statement 3: Wastage Due to Delay in Sorting Decisions**

We believe that daily market sellers face unnecessary delays in sorting produce because of lack of immediate feedback systems. This causes missed opportunities for timely sale and leads to wastage.

**Elaboration:**  
• **Customer Type:** Daily market sellers  
• **Core Problem:** No tool to aid real-time sorting  
• **Root Causes:**

* Manual inspection is slow
* No quick AI feedback  
  • **Negative Impacts:**
* Unsorted mixed-quality produce
* Economic loss

**Conclusion**

The empathy-driven research helped us deeply understand the challenges in fresh produce management. Our Smart Sorting system, based on transfer learning, aims to bridge the gap between manual inspection and intelligent automation — delivering accurate, real-time classification of fruits, without the need for expensive tools or complex setups. This can empower local farmers, vendors, and storage handlers to reduce waste, save time, and improve quality control with a smart, accessible solution.