Solution Requirements (Functional & Non-functional)

Date	8July 2025
Team ID	LTVIP2025TMID36983
Project Name	Smart Sorting: Transfer Learning for Identifying Rotten Fruits and Vegetables
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Image Capture & Processing	Capture image of a single fruit/vegetable Pre-process image (resizing, normalization) Input image to the classification model
FR-4	Rotten/Fresh Classification	Run inference using the pre-trained and fine-tuned model Output classification result (e.g., "Fresh", "Rotten", or "Uncertain") Display confidence score for the classification
FR-5	User Feedback & Model Improvement	Allow users to provide feedback on classification accuracy Store misclassified images for future model retraining Facilitate over-the-air (OTA) model updates
FR-6	System Integration & Control	Trigger sorting mechanism based on classification (Optional) Integrate with a simple display for results (Optional) Provide API for integration with larger systems
FR-7	Data Management	Store classification logs (timestamp, result) Monitor system performance and usage statistics Manage user accounts and permissions
FR-8	Hardware Interaction	Interface with camera module Control sorting actuator/mechanism (e.g., flap, conveyor diversion) Manage power supply and status indicators

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system should have an intuitive and simple user interface (if applicable, for configuration or feedback) requiring minimal training. The physical design of the sorting unit should be easy to set up, operate, and clean. Visual indicators should clearly communicate system status (e.g., ready, processing, error, fresh, rotten).
NFR-2	**Security**	If network connectivity is involved (for updates or data logging), data transmission should be encrypted. User authentication and authorization mechanisms (e.g., for accessing feedback or configuration settings) should be robust. Physical security measures should prevent tampering with the device or its internal components
NFR-3	**Reliability**	The classification accuracy for common fruits/vegetables should be at least 95% under normal operating conditions. The system should operate continuously for at least 8 hours without requiring manual intervention. The mean time between failures (MTBF) for the hardware components should meet industry standards for agricultural or small-scale machinery. The system should gracefully handle power interruptions and resume operation without data loss.
NFR-4	**Performance**	The classification of a single fruit/vegetable should be completed within 0.5 seconds to ensure efficient sorting throughput. The system should maintain its performance under varying lighting conditions and minor positional variations of the produce. The model inference should have low latency suitable for real-time sorting.
NFR-5	**Availability**	The system should be operational 99% of the time during planned working hours. Critical components should have easily accessible spares or readily available replacements. Software updates and maintenance should be designed to minimize downtime.
NFR-6	**Scalability**	The system should be able to handle an increasing variety of fruits and vegetables by adding new training data and updating the model. The design should allow for easy replication of units to scale up sorting capacity. The underlying AI model should be adaptable to different hardware configurations, from embedded systems to more powerful servers, to support various throughput requirements.