**Project Design Phase**

**Proposed Solution Template**

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| Date |  |
| Team ID |  |
| Project Name |  |
| Maximum Marks |  |

**Proposed Solution Template:**

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

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| **S.No.** | **Parameter** | **Description** |
| 1. | Problem Statement (Problem to be solved) |  |
| 2. | Idea / Solution description |  |
| 3. | Novelty / Uniqueness |  |
| 4. | Social Impact / Customer Satisfaction |  |
| 5. | Business Model (Revenue Model) |  |
| 6. | Scalability of the Solution |  |

**IDEATION PHASE**

**2.1.Problem Statement**

In the agricultural and food industries, ensuring the quality of fruits and vegetables is critical for consumer safety, satisfaction, and reducing waste. Traditionally, sorting and grading of produce are performed manually, which is time-consuming, labor-intensive, error-prone, and inefficient at large scales. Identifying rotten or substandard fruits and vegetables accurately and quickly remains a challenge, especially in high-throughput environments like factories, warehouses, and markets.

There is a pressing need for an intelligent, automated sorting system that can efficiently distinguish between fresh and rotten produce with high accuracy. Leveraging artificial intelligence, particularly transfer learning, offers a promising solution. By using pre-trained models and adapting them to the task of classifying fruits and vegetables based on their visual characteristics, the sorting process can be made faster, more reliable, and cost-effective.

This project aims to design and implement a smart sorting system using transfer learning techniques to automatically identify and segregate rotten fruits and vegetables. The solution seeks to enhance food quality control, minimize human error, and contribute to the reduction of food waste.

* **Objectives**
* To develop an AI-based system capable of classifying fruits and vegetables as fresh or rotten.
* To apply transfer learning techniques using pre-trained convolutional neural networks (CNNs) for image classification.
* To build a dataset of images of fruits and vegetables representing both fresh and rotten conditions.
* **Methodology**

1. Dataset Collection:

Collect images of various fruits and vegetables in fresh and rotten states using publicly available datasets and/or custom image capturing.

2. Data Preprocessing:

Resize and normalize images.

Perform data augmentation (rotation, flipping, zooming) to increase model robustness.

3. Model Development:

Select a pre-trained model (e.g., MobileNet, ResNet, VGG).

Apply transfer learning by fine-tuning the model on the fruits and vegetables dataset.

4. Training and Validation:

Split the data into training and validation sets.

Train the model and monitor performance metrics (accuracy, loss).

5. Testing:

Test the model on unseen data and generate a confusion matrix.

6. Deployment / Demonstration:

Integrate the model into a sorting simulation or real-time setup.

Visualize the sorting process, showing fresh and rotten classification.

* **Expected Outcomes**
* A working AI model that classifies fruits and vegetables as fresh

or rotten with high accuracy.

* A report on performance metrics of the model.
* A demonstration (either simulated or hardware-integrated) of the sorting mechanism.
* **Tools and Technologies**
* Python, TensorFlow / Keras / PyTorch
* OpenCV for image processing
* Jupyter Notebook / Google Colab
* Dataset sources: Kaggle / Custom dataset