**Project Design Phase**

**Proposed Solution Template**

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| Date | 15 February 2025 |
| Team ID | LTVIP2025TMID38530 |
| Project Name | GrainPalette: A Deep Learning Odyssey in Rice Type Classification Through Transfer Learning |
| Maximum Marks | 2 Marks |

**Proposed Solution Template:**

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

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| **S.No.** | **Parameter** | **Description** |
|  | Problem Statement (Problem to be solved) | Manual rice type classification is labor-intensive, prone to human error, and inefficient, especially when dealing with visually similar rice varieties. This affects quality control, trade accuracy, and overall productivity in the agricultural supply chain. |
|  | Idea / Solution description | GrainPalette uses deep learning and transfer learning techniques to automatically classify five rice types — Arborio, Basmati, Ipsala, Jasmine, and Karacadag — from images. A pre-trained CNN model is fine-tuned to identify rice grains with high accuracy, and results are presented through a user-friendly interface. |
|  | Novelty / Uniqueness | The model leverages transfer learning, reducing the need for massive datasets while maintaining high accuracy. Unlike general-purpose classifiers, GrainPalette is specifically trained for fine-grained classification of morphologically similar rice varieties — a relatively unexplored niche. |
|  | Social Impact / Customer Satisfaction | Automating rice classification helps farmers, quality inspectors, exporters, and retailers by improving consistency, reducing costs, and enhancing the reliability of trade. This boosts trust in product quality and supports sustainable agriculture practices. |
|  | Business Model (Revenue Model) | GrainPalette can adopt a B2B SaaS model, offering paid subscriptions for agri-tech firms, exporters, and inspection agencies. Additional revenue streams include API access for integration, mobile app subscriptions, and custom deployment for enterprises. |
|  | Scalability of the Solution | The solution is scalable both horizontally and vertically — it can be adapted for other grains (e.g., wheat, barley) or expanded to include more rice varieties. With cloud deployment, it can serve clients across geographies and scale with minimal infrastructure changes. |