**8Project Design Phase**

**Proposed Solution Template**

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| Date | 28 June 2025 |
| Team ID | LTVIP2025TMID40163 |
| Project Name | grainpalette - a deep learning odyssey in rice type classification through transfer learning |
| Maximum Marks | 2 Marks |

### 🌾 Proposed Solution Template – GrainPalette: Deep Learning for Rice Variety Classification

| **S.No.** | **Parameter** | **Description** |
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| 1. | **Problem Statement (Problem to be solved)** | Manual classification of rice varieties is prone to **inaccuracy, delays, and inconsistency**, especially in large-scale operations. This leads to **incorrect pricing, quality mismatches, export issues, and labor inefficiency**. An automated system is essential to ensure accurate, fast rice classification. |
| 2. | **Idea / Solution Description** | GrainPalette leverages **transfer learning with MobileNet/ResNet** to classify rice varieties (e.g., Basmati, Jasmine, Arborio) based on grain images. The model is integrated into a **Flask web app** that supports image uploads, real-time prediction, and responsive feedback. It can run on **basic systems** and can be easily extended. |
| 3. | **Novelty / Uniqueness** | This solution uses **pre-trained CNNs** to achieve high accuracy with fewer training images. Unlike traditional physical inspection or hardware-heavy systems, it provides a **lightweight, accessible, and scalable** solution. The project also includes a clean UI and visualization to boost usability. |
| 4. | **Social Impact / Customer Satisfaction** | GrainPalette minimizes **human error** and enhances **efficiency** in grain sorting, which helps **farmers, millers, and distributors** maintain consistent quality. This not only boosts consumer trust but also helps meet **export compliance** and reduce losses due to misclassification or mix-ups. |
| 5. | **Business Model (Revenue Model)** | The system could be packaged as a **subscription-based SaaS platform** for agri-startups and SMEs, or as a **one-time licensed product** for large-scale mills. Add-ons could include **premium model tuning**, **mobile version**, or integration with **logistics/traceability systems** in the supply chain. |
| 6. | **Scalability of the Solution** | The solution can easily be **expanded to other grains (wheat, barley, etc.) or pulses**, and adapted to **different regions and lighting conditions**. It can also be upgraded to detect **impurities**, **foreign matter**, or **grain defects** in future versions using fine-tuned models and multi-label classification. |