Project Design Phase
Problem – Solution Fit Template

Date	28 June 2025
Team ID	LTVIP2025TMID41808
Project Name	Grainpalette - a deep learning odyssey in rice type classification through transfer learning
Maximum Marks	2 Marks

Problem – Solution :

The Problem–Solution Fit in the **GrainPalette** project means that we have identified a practical and recurring issue faced by **agriculture professionals, food quality inspectors, and grain processing units** — the **manual classification of rice grains** is slow, subjective, and prone to inconsistency.

Our proposed solution — an **AI-powered rice grain classification system using transfer learning** — directly addresses this challenge. By automating the process, we offer improved **speed, accuracy, and standardization**, ensuring that the solution is not only technically sound but also genuinely solves the user's day-to-day operational bottlenecks.

Purpose:

❏ Solve complex classification challenges in a way that fits the workflow of grain quality inspectors and agri-processing units. Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.

❏ Succeed faster and promote solution adoption by using commonly accepted platforms like **Kaggle Notebooks** or **Streamlit** for ease of access and integration.

❏ Sharpen our system usability and reporting by giving clear feedback, visual predictions, and intuitive interfaces that align with inspector expectations.

❏ **Increase trust and engagement with our solution by addressing key pain points like inconsistent grading, slow processing, and manual labor dependency.**

❏ Understand existing manual classification workflows in order to significantly **improve efficiency, reliability**, and **scalability** for stakeholders involved in rice grain inspection.

Template:

References:

1. https://www.ideahackers.network/problem-solution-fit-canvas/
2. https://medium.com/@epicantus/problem-solution-fit-canvas-aa3dd59cb4fe

Project Design Phase
Proposed Solution Template

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Proposed Solution :

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Manual rice grain classification is inefficient, subjective, and prone to errors, leading to inconsistency in grain quality assessment and processing.
2.	Idea / Solution description	We propose an AI-based image classification system using **transfer learning** with pre-trained CNN models (e.g., MobileNetV2) to identify rice grain types. Users can upload an image of a grain sample, and the system will predict the type (e.g., Basmati, Jasmine) with high accuracy. This improves reliability, consistency, and speed in classification tasks.
3.	Novelty / Uniqueness	Unlike traditional systems, our solution uses **transfer learning**, reducing training time and requiring less data. It is designed to be **lightweight**, **deployable on web platforms**, and suitable for use in **low-resource agricultural setups**.
4.	Social Impact / Customer Satisfaction	This solution assists **agricultural inspectors, farmers, and food processing units** by providing fast, automated, and accurate classification, improving efficiency and reducing human workload. It ensures higher quality control and builds confidence among stakeholders.
5.	Business Model (Revenue Model)	The solution can be offered as a **subscription-based SaaS platform** or as a **custom deployment for rice mill industries**. Additional revenue streams include analytics dashboards, premium support, and model training services.
6.	Scalability of the Solution	The system is highly scalable — it can be trained on additional grain types, extended to other crops, and integrated into mobile or enterprise systems for **larger agricultural businesses or cooperatives**.

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Solution Architecture:

The architecture of the **GrainPalette** system is designed to be modular, efficient, and scalable. It consists of the following major components:

1. **User Interface (UI):**
   A web-based or notebook-based frontend (Streamlit / Kaggle Notebook) that allows users to upload images of rice grains.

2. **Backend (Inference Engine):**
   The uploaded image is sent to a backend process where preprocessing is applied (resizing, normalization, etc.), and the model is invoked to predict the rice grain class.

3. **Model (Transfer Learning):**
   A pre-trained CNN model (e.g., MobileNetV2) is fine-tuned using a labeled dataset of rice grain images. This model is responsible for feature extraction and classification.

4. **Output Layer:**
   The predicted rice grain type is displayed to the user along with a confidence score, and optionally saved/logged for reporting or analysis.
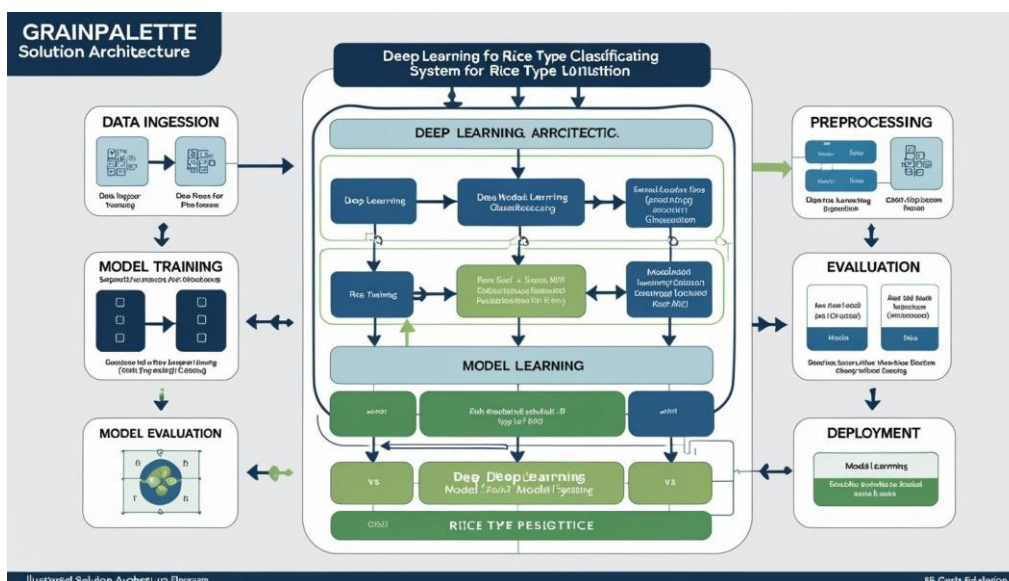
Example - Solution Architecture Diagram:

Figure 1: Architecture and data flow of the voice patient diary sample application

Reference: https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/