

Machine Learning

Date	31 January 2025
Team ID	LTVIP2025TMID60812
Project Name	Grain Palette - A Deep Learning Odyssey In Rice Type Classification Through Transfer Learning
Maximum Marks	4 Marks

Machine Learning Overview

□ Definition

Machine Learning (ML) is a subfield of artificial intelligence (AI) that enables systems to learn from data, identify patterns, and make decisions or predictions with minimal human intervention. Instead of being explicitly programmed with rules, ML systems improve their performance by learning from experience (i.e., data).

□ Types of Machine Learning

1. Supervised Learning

- **Definition:** The model learns from labeled data (i.e., input-output pairs).
- **Example in this project:** Rice grain images (input) labeled with their variety (output).
- **Common Algorithms:** Support Vector Machines (SVM), Decision Trees, Neural Networks.

2. Unsupervised Learning

- **Definition:** The model learns patterns or groupings from **unlabeled data**.
- **Use Case (not used here but relevant):** Clustering rice grains based on shape or color without predefined labels.
- **Algorithms:** K-Means, PCA, Hierarchical Clustering.

3. Semi-Supervised Learning

- **Definition:** Combines a small amount of labeled data with a larger set of unlabeled data to improve learning accuracy.
- **Use Case:** Labeling a small subset of rice types, then using unlabeled images to train the model further.

4. Reinforcement Learning

- **Definition:** The model learns by trial and error, receiving rewards or penalties for actions.
- **Less relevant here** but used in robotics or automation in agriculture.

□ Relevance to Rice Classification

In the **Grain Palette** system:

- **Supervised Learning** is used.
- Pre-trained **deep learning** models (a subfield of ML) are fine-tuned on labeled rice images to classify grain varieties.
- **Transfer Learning** helps by using knowledge from a different domain (e.g., ImageNet-trained CNNs) to solve a new but related problem.

□ □ Key Components in ML Workflow

1. **Data Collection:** Gathering and labeling rice grain images.
2. **Data Preprocessing:** Resizing, augmenting, and normalizing images.
3. **Model Selection:** Choosing algorithms (e.g., CNNs like ResNet or EfficientNet).
4. **Training:** Feeding data into the model to learn patterns.
5. **Validation & Testing:** Checking accuracy on unseen data.
6. **Deployment:** Using the trained model in real-world applications.