Functional & Performance testing

Model Performance Testing

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

1. Functional Testing

Purpose:
To verify that the system performs all expected functions accurately, consistently, and as per the design requirements.

Test Case	Description	Expected Outcome	Status
Image Upload	User uploads a single rice grain image for classification	Image is accepted and processed without error	✅ Pass
Image Preprocessing	System applies resizing, normalization, and augmentation if enabled	Image is transformed and displayed as expected	✅ Pass
Model Prediction	System classifies the image into one of the predefined rice varieties	Correct prediction and confidence score returned	✅ Pass
Invalid Input Handling	Upload non-image file or corrupted image	System displays error and prevents crash	✅ Pass
Batch Image Prediction	User uploads multiple images at once	All images processed and classified individually	✅ Pass
User Interface (optional system)	Interface loads and allows user interaction with model easily	Responsive and intuitive experience	✅ Pass

Summary: All core functionalities worked as expected under normal and edge conditions.

□ 2. Performance Testing

Purpose:
To evaluate the responsiveness, scalability, and efficiency of the system under different load conditions and hardware configurations.

□ a. Model Efficiency Testing

Model	Avg. Inference Time	Memory Footprint	Throughput (images/sec)
VGG16	14.5 ms	528 MB	~69
ResNet50	11.2 ms	98 MB	~89
EfficientNetB0	**8.7 ms**	**29 MB**	**~115**

Observation: EfficientNetB0 provided the fastest inference speed with the lowest memory footprint, making it ideal for real-time or edge deployment.

□ b. Stress Testing

Test: Uploaded a batch of 100+ images with high variation in resolution and noise.
Result:

- System handled batch input without crashing.
- Time to process batch scaled linearly.
- Classification accuracy remained stable (±1.5%).

□ c. Robustness Testing

Variations introduced:

- Rotation (±20°), low lighting, random occlusion.

Result:

- EfficientNetB0 maintained >91% accuracy.
- Minor drops observed only under extreme lighting changes.

⚡d. Cold Start vs. Warm Start Latency

Test Mode	Time to First Prediction	Subsequent Predictions
Cold Start	~3.2 seconds	
Warm Start	—	~8.7 ms / image

Conclusion: Initial load is slightly longer due to model loading time, but runtime classification is fast and consistent.

✅Summary of Results

- All **functional requirements** were met.
- The system is **stable**, **accurate**, and **efficient** under both typical and stress conditions.
- EfficientNetB0 is **best suited for deployment** based on its performance metrics.