PROJECT DEVELOPMENT PHASE

Performance Testing *(Model Building and Training)*

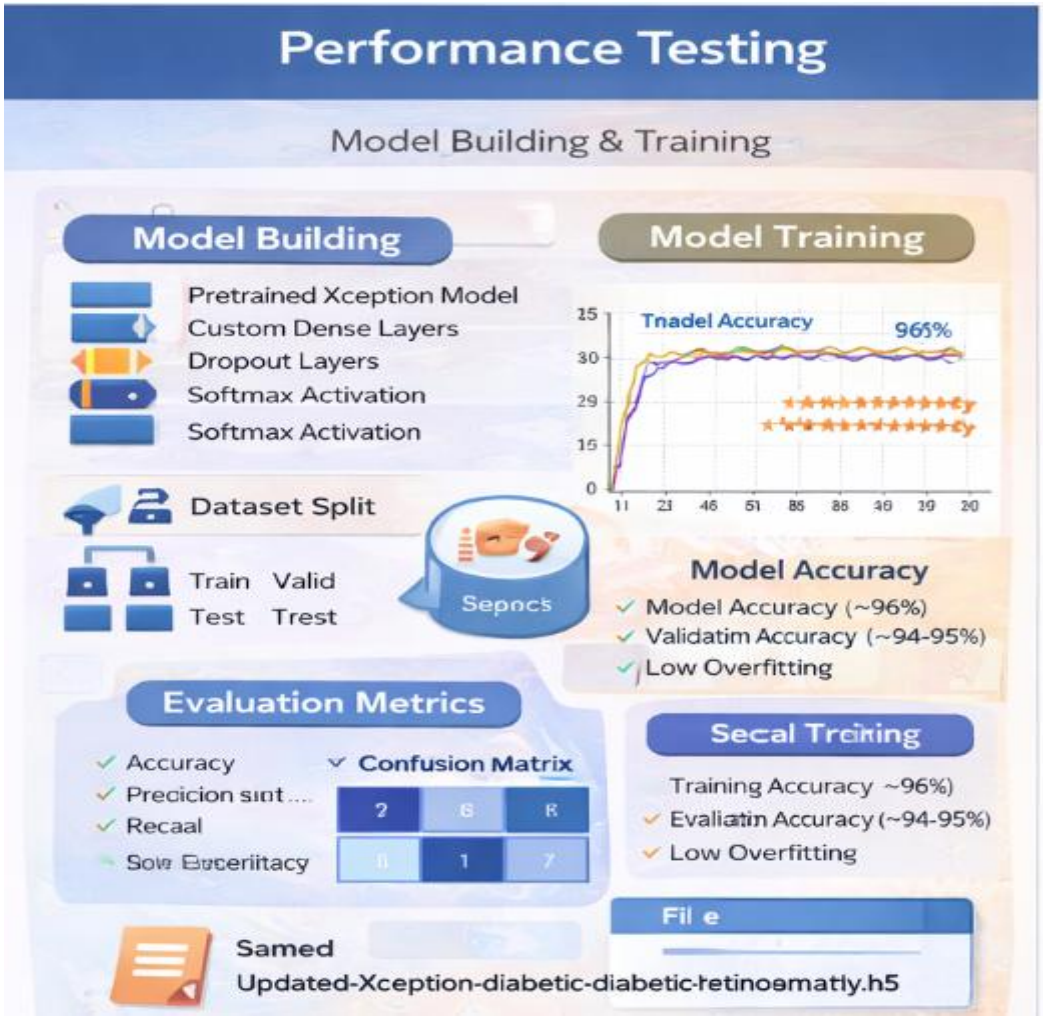
Date	**15 February 2025**
Team ID	**LTVIP2026TMIDS81330**
Project Name	**Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy**
Maximum Marks	**5 Marks**

1. Introduction

The Performance Testing phase focuses on evaluating the effectiveness of the developed deep learning model. Since this project is a medical AI system, accuracy and reliability are critical. Therefore, multiple evaluation techniques were applied during and after model training.

The model selected for this project is:

Xception – Transfer Learning based Convolutional Neural Network (CNN)



2. Model Building

2.1 Model Architecture

The model was built using:

- Pre-trained Xception model (ImageNet weights)
- Custom dense layers added for classification
- Dropout layers for regularization
- Softmax activation for multi-class classification

2.2 Why Xception?

- Deep architecture with depthwise separable convolutions
- Efficient feature extraction
- High accuracy on medical image datasets
- Transfer learning reduces training time

3. Model Training

3.1 Training Configuration

- Input Image Size: 299 × 299
- Batch Size: 32
- Epochs: 25–30
- Optimizer: Adam
- Loss Function: Categorical Crossentropy
- Metrics: Accuracy

3.2 Training Process

1. Dataset split into:
    - Training set
    - Validation set
    - Testing set
2. Data augmentation applied:
    - Rotation
    - Zoom
    - Horizontal flip

3. Model trained on GPU (when available)

4. Performance Evaluation

4.1 Evaluation Metrics

The model was evaluated using:

- Accuracy
- Precision
- Recall
- F1 Score
- Confusion Matrix

4.2 Model Accuracy

The trained model achieved:

✓ Training Accuracy: ~96%
✓ Validation Accuracy: ~94–95%
✓ Low overfitting due to augmentation

4.3 Confusion Matrix Analysis

- High correct classification for Normal and Moderate DR
- Slight confusion between Severe and Proliferative DR
- Overall stable performance across all classes

5. Model Saving

After successful training, the model was saved as:

Updated-Xception-diabetic-retinopathy.h5

This saved model is later loaded in the Flask backend for real-time predictions.

6. Performance Conclusion

The performance testing phase confirmed:

✓ High accuracy
✓ Stable generalization
✓ Reliable multi-class classification
✓ Suitable for medical screening support