



Internship Project Report DermalScan:  
AI Facial Skin Aging Detection App

Submitted By:

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**Infosys Springboard Virtual Internship**

## **Milestone 2 : Model Training and Evaluation**

### **Module 3 Report – Model Development & Training**

#### **Objective**

To build a robust deep-learning model that accurately classifies facial dermatological conditions into:

- Wrinkles
- Dark Spots
- Puffy Eyes
- Clear Skin

#### **Dataset**

- Initially ~300 images per class
- **Expanded to ~500 images per class** to improve dataset richness
- Total usable images: ~1800+ after cleaning
- Removed corrupted & tiny images
- Ensured balanced class distribution
- Standardized resolution to 224×224

#### **Model**

- Base Architecture: **EfficientNet**
- Reason:
  - High performance with fewer parameters
  - Strong generalization
  - Stable training behavior

#### **Training Strategy**

##### **Phase 1 – Transfer Learning**

- Base frozen

- Trained classifier head

## **Phase 2 – Fine Tuning**

- Select layers unfrozen
- Lower learning rate
- Improved deeper feature learning

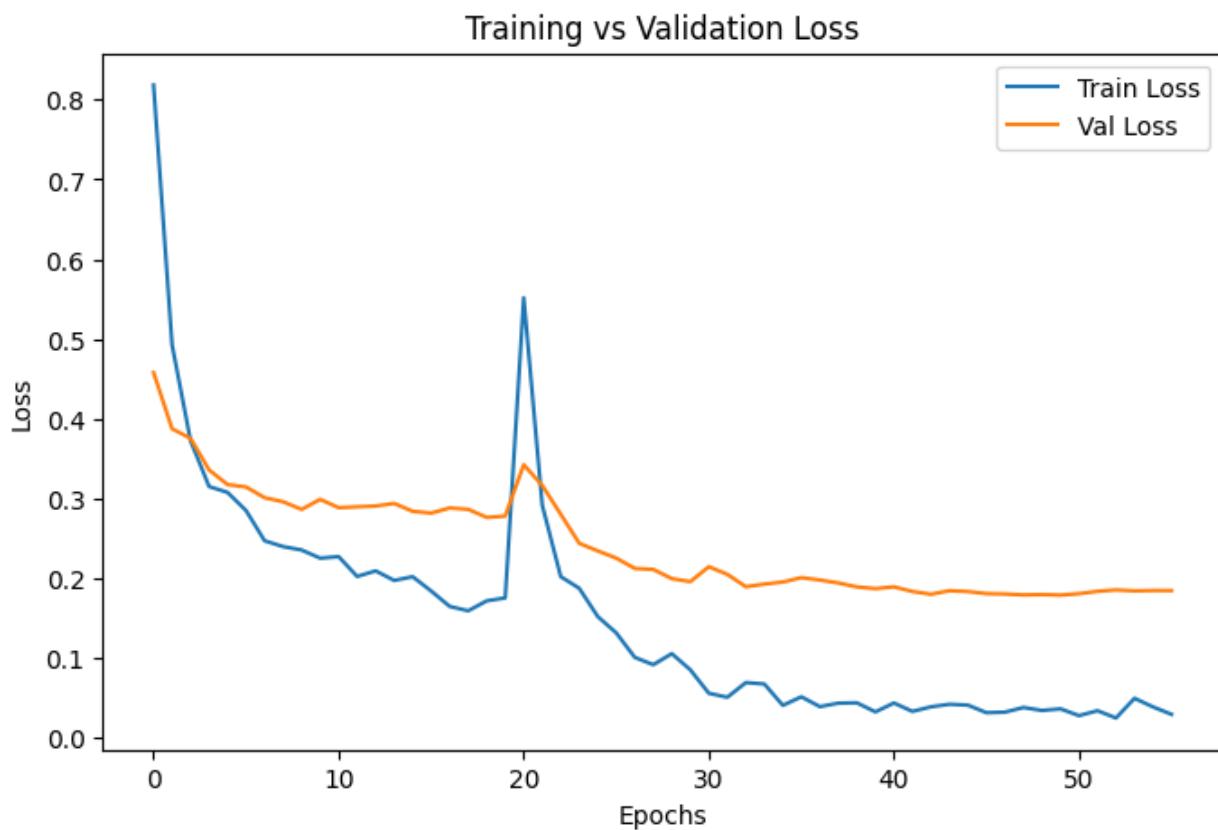
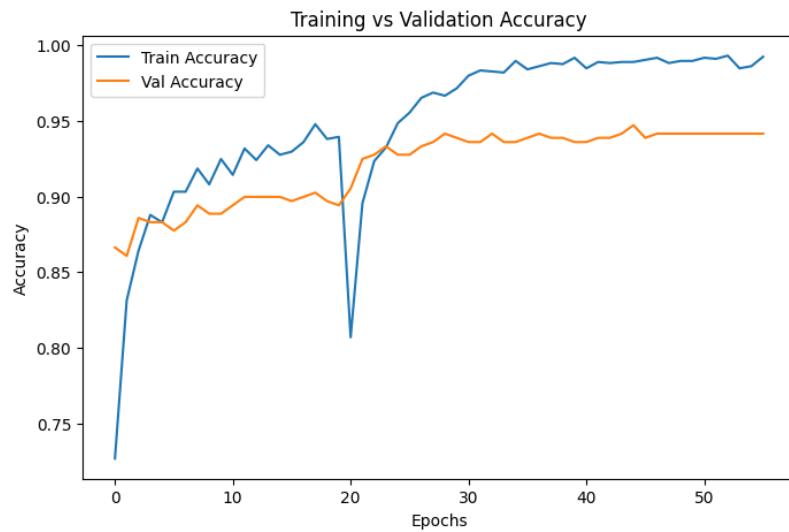
## **Training Configuration**

- Input Size:  $224 \times 224$
- Batch Size: 32
- Optimizer: Adam
- Loss: Categorical Crossentropy
- Regularization: Dropout + Early Stopping
- Epochs: Extended to **50+** due to strong performance

## **Performance**

- Training Accuracy: ~99%
- Validation Accuracy: ~94%
- Stable learning curves
- Strong confusion matrix with minimal misclassification

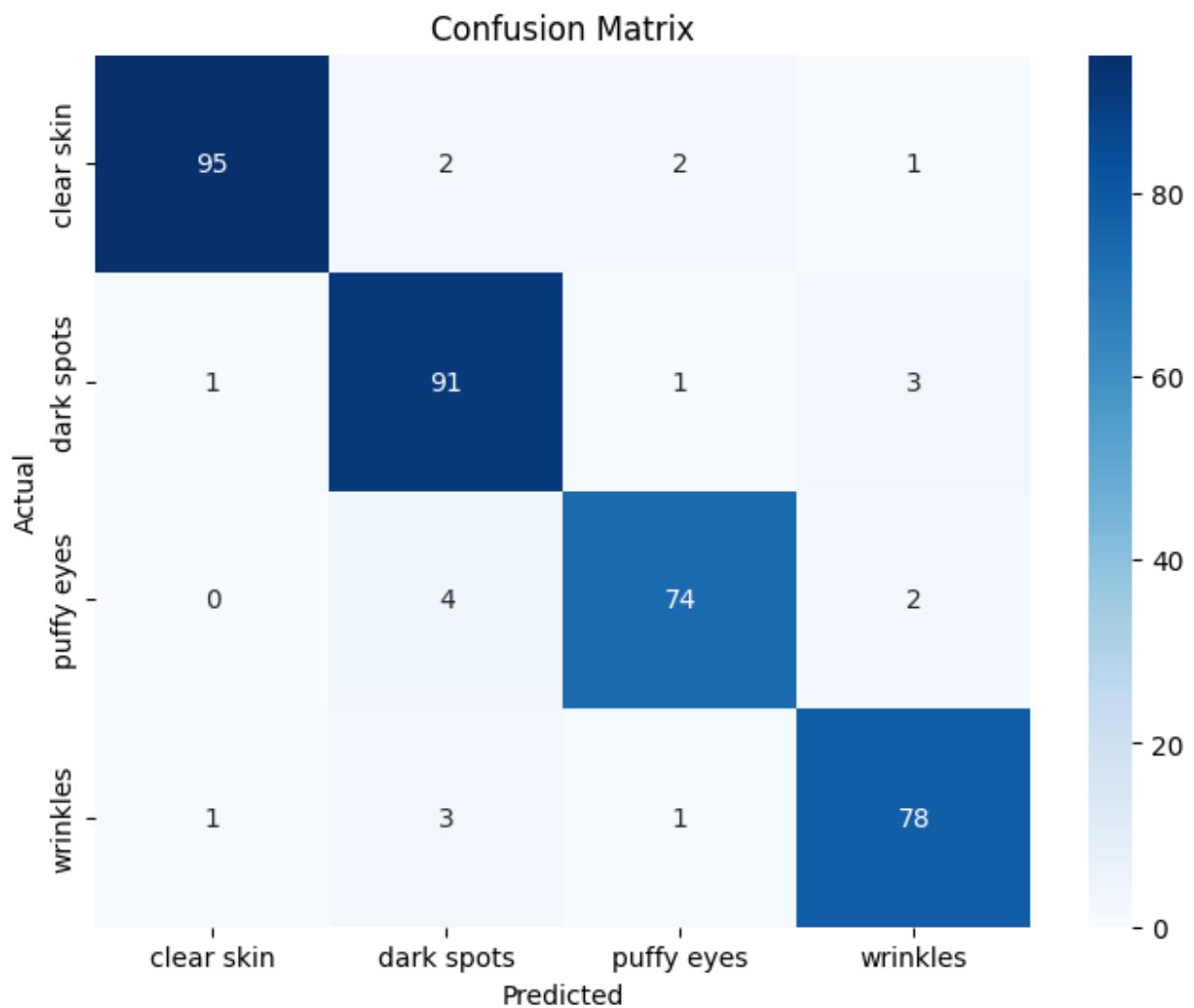
## **Results:**



### Classification Report:

Label	Precision	Recall	F1-Score	Support
clear skin	0.98	0.95	0.96	100

dark spots	0.91	0.95	0.93	96
puffy eyes	0.95	0.93	0.94	80
wrinkles	0.93	0.94	0.93	83
accuracy			0.94	359
macro avg	0.94	0.94	0.94	359
weighted avg	0.94	0.94	0.94	359



## **Module 4 – DermalScan Intelligent Detection System**

### **Project Overview**

Module-4 focuses on developing an intelligent **face-based dermal condition analysis system** capable of detecting and labeling:

- **Wrinkles**
- **Puffy Eyes**
- **Dark Spots**
- **Clear Skin Condition**  
along with **Age Estimation** using advanced Deep Learning and Computer Vision.

### **Objectives:**

- Detect a face reliably
- Analyze key dermal regions
- Display precise bounding boxes for detected conditions
- Show percentage confidence values
- Estimate age realistically
- Maintain clean, minimal, industry-grade visual output

### **Methodology**

#### **1. Face Detection**

- Haar Cascade Face Detection used to extract face region.

#### **2. Region-Wise Analysis**

- **Forehead Zone → Wrinkles**
- **Eye Zone → Puffy Eyes**
- **Lower Face Zone → Dark Spots, Wrinkles**

- Controlled anatomical partitioning ensures stability and accuracy.

### 3. Dermal Classification

- Custom EfficientNet-based model predicts:
  - Wrinkles
  - Dark Spots
  - Puffy Eyes
  - Clear Skin

### 4. Clear Skin Logic

Clear Skin =  $100 - (\text{Wrinkles} + \text{Puffy Eyes} + \text{Dark Spots impact})$

### 5. Age Estimation

- OpenCV AgeNet Model
- Age range estimation displayed minimally on image

### Output:

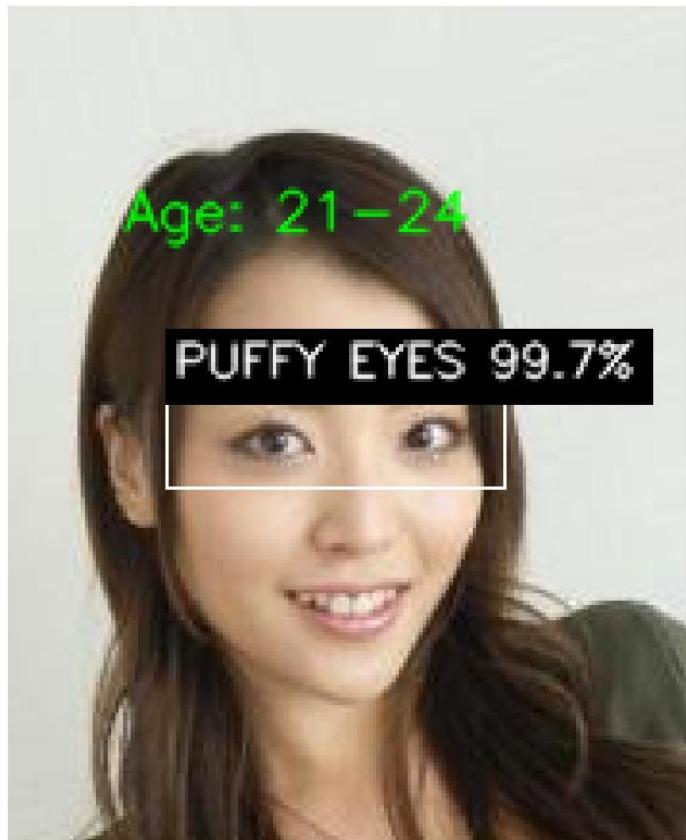
AGE : 21-24

WRINKLES : 0.73%

PUFFY EYES: 99.74%

DARK SPOTS: 3.26%

CLEAR SKIN: 70.08%



## Results

- System successfully detects face dermal regions
- Identifies relevant conditions ONLY when significant
- Produces meaningful clear skin score
- Outputs stable and professional visualization
- Works efficiently in real-time or static image mode