Project Title: DermalScan: AI_Facial Skin Aging Detection App

Infosys SpringBoard Virtual Internship Program

Subimtted by:

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Problem Statement

Skin-related issues such as dark spots, wrinkles, and puffy eyes are common concerns affecting people of different ages. Accurate and early identification of these conditions can support better skincare decisions and help detect underlying health problems.

Manual diagnosis is often subjective, time-consuming, and requires expert knowledge, making automated computer-vision solutions highly beneficial.

To build an intelligent skin-analysis model, the first and most important requirement is to ensure that the image dataset is well-organized and properly represented. Without a correctly structured dataset, the performance of machine learning algorithms becomes unreliable. Additionally, skin-image datasets are often limited or imbalanced, which can negatively affect model accuracy — therefore, data augmentation is necessary to increase diversity and prevent bias.

Outcomes

- Collected and organized skin images into four categories
- Performed image validation and dataset statistics
- Applied data augmentation to improve dataset size and balance
- Preprocessed images for model training
- Built and evaluated a CNN model for skin-condition classification
- System can classify wrinkles, dark spots, puffy eyes, and clear skin automatically

Introduction

Skin-related conditions such as wrinkles, puffy eyes, and dark spots are common cosmetic and dermatological concerns. Early detection helps individuals make informed skincare decisions and can reflect underlying health conditions. Manual examination by dermatologists can be time-consuming, subjective, and inaccessible to many people. Artificial Intelligence, particularly Deep Learning, enables automated and accurate skin-condition assessment from facial images. This project focuses on identifying specific signs of facial skin aging using image classification techniques.

Milestone 1: Dataset Preparation and Preprocessing

Module 1: Dataset Setup and Image Labeling

Collected and organized images across categories: clear skin, acne, dark spots, puffy eyes, wrinkles. Loaded images using TensorFlow/Keras and converted them into array format. Ensured consistent dimensions and validated dataset quality through visualization. Prepared a clean, structured dataset ready for preprocessing and model development. Plotted data distribution for each category using a bar graph to verify class balance

Code:

```
import os

import matplotlib.pyplot as plt

folder_path = r"C:\Users\ambat\Downloads\DATASET-20251203T133241Z-1-001\DATASET"

print(os.listdir(folder_path))

image_exts = (".jpg", ".jpeg", ".png", ".bmp", ".gif")

classes = ["clear skin","Dark spots","puffy eyes","wrinkles"]

counts = []

#image count

for c in classes:

    folder = os.path.join(folder_path, c)

    count = sum(

        1 for f in os.listdir(folder)

        if os.path.isfile(os.path.join(folder, f))

        and f.lower().endswith(image_exts)

    )

    counts.append(count)

    print(f"{c}: {count} images")

plt.figure(figsize=(8,5))

colors = ['blue', 'green', 'yellow', 'violet']

# bar chart

plt.bar(classes, counts, color=colors)

plt.title("Number of Images in Each Class")

plt.xlabel("Classes")

plt.ylabel("Number of Images")

for i, count in enumerate(counts):

    plt.text(i, count + 1, str(count), ha='center', fontsize=12)

plt.show()
```
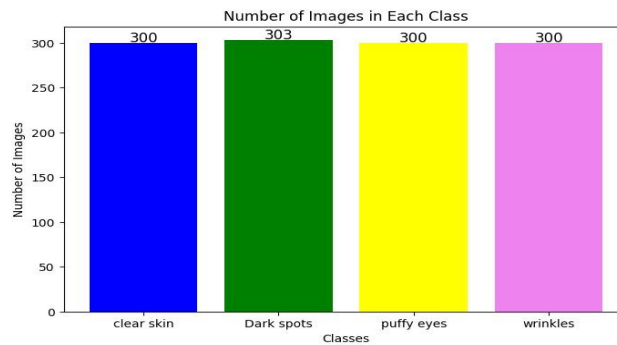
Output:

Fig1:Distribution of Images in Bar Graph

Module 2: Image Prepocessing and Augumentation

 Implemented an augmentation pipeline using Keras ImageDataGenerator. Applied key transformations: rotation, zoom, shifts, shear, brightness adjustment, and horizontal flip. Generated multiple augmented samples for each image to increase dataset diversity. Visualized original vs. augmented images to validate augmentation behavior.. Produced a more robust and varied dataset suitable for deep-learning model training.

Code:

```
import matplotlib.pyplot as plt

from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img,
img_to_array

import numpy as np

image_list = [

    r"C:\Users\ambat\Downloads\DATASET-20251203T133241Z-1-001\DATASET\clear
skin\clear_skin_061.jpg",

    r"C:\Users\ambat\Downloads\DATASET-20251203T133241Z-1-001\DATASET\dark
spots\2de295c0-801d-429e-8f74-fce181cc87cc.jpg",

    r"C:\Users\ambat\Downloads\DATASET-20251203T133241Z-1-001\DATASET\puffy
eyes\14.jpg",

    r"C:\Users\ambat\Downloads\DATASET-20251203T133241Z-1-
001\DATASET\wrinkles\36.jpg"

]


# Augmentation Configuration

aug = ImageDataGenerator(

    rotation_range=30,

    zoom_range=0.25,

    width_shift_range=0.1,

    height_shift_range=0.1,

    brightness_range=[0.7, 1.3],

    horizontal_flip=True,

    vertical_flip=True

)
```

```
#  Displaying
rows = 5
cols = 5

plt.figure(figsize=(12, 6))

for row, img_list in enumerate(image_list):

    # Load image
    original = load_img(img_list, target_size=(224, 224))
    arr = img_to_array(original)
    arr = np.expand_dims(arr, axis=0)

    # Show Original Image
    plt.subplot(rows, cols, row * cols + 1)
    plt.imshow(original)
    plt.title(f"Original {row+1}")
    plt.axis("off")

    # Show Augmented images
    for j in range(4):
        augmented = next(aug.flow(arr, batch_size=1))[0].astype("uint8")
        plt.subplot(rows, cols, row * cols + (j + 2))
        plt.imshow(augmented)
        plt.title(f"Aug {j+1}")
        plt.axis("off")

plt.tight_layout()
plt.show()
```

Output:

Fig2: visualization of Augmented Images

Libraries :

1. TensorFlow / Keras

Modules Used: load_img, img_to_array, ImageDataGenerator

Purpose: Loading input images into a workable format. Converting images to numerical arrays for processing. Applying augmentation techniques (rotation, zoom, shift, brightness, flip, shear), Managing preprocessing pipelines for deep-learning workflows

2. NumPy

Purpose: Numerical operations on image arrays, Array reshaping, normalization, and manipulation, Supporting backend computations for augmentation

3. Matplotlib (matplotlib.pyplot)

Purpose: Visualizing original images, Displaying augmented images in grid format. Validating dataset structure and augmentation results

 4. OS Library (import os)

Purpose: Folder traversal , Dataset loading import os