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# Hybrid Skin Disease Diagnosis Using StyleGAN2 and EfficientNet

**Base Folder Location - <https://drive.google.com/drive/folders/1rUwqZbuf3yt5CTr-uWrbJ1JwANTg7CH2?usp=sharing>**

**Data Location - <https://drive.google.com/drive/folders/1gkqxv3khKN8NEMzwkfSlvyJT7a7esBLw?usp=sharing>**

**Trained GAN Model - <https://drive.google.com/drive/folders/1jnYc4X5ObEK8nPPFFBg5ksK2wj_pQ6oy?usp=sharing>**

# Overview

This repository contains the implementation of a hybrid architecture combining **StyleGAN2** and **UNet** for synthetic data generation and an **EfficientNet-B5** classifier for automated skin disease detection. The framework addresses challenges like data scarcity, class imbalance, and variability in dermatological datasets. The workflow includes preprocessing, synthetic image generation, model training, and evaluation.

# Prerequisites

To run the notebook successfully, ensure the following dependencies and system requirements are met:

### **System Requirements**

**Operating System**: Windows/Linux/macOS

**RAM**: Minimum 16 GB

**GPU**: NVIDIA GPU with CUDA support (Tesla V100, RTX 2080, or higher)

**Python Version**: Python 3.8 or higher

### **Libraries and Frameworks**

Install the following Python libraries before running the notebook:

TensorFlow

PyTorch

NumPy

Matplotlib

Seaborn

Torchvision

TorchMetrics

scikit-learn

Pillow

### CUDA and cuDNN

Ensure CUDA and cuDNN are installed to leverage GPU acceleration for training:

**CUDA version**: 11.2 or higher

**cuDNN version**: Compatible with the installed CUDA version

## **Setup Instructions**

**Base Folder Location - <https://drive.google.com/drive/folders/1rUwqZbuf3yt5CTr-uWrbJ1JwANTg7CH2?usp=sharing>**

### Clone the Repository

Clone the repository to your local system:

### https://github.com/MrunalMeshram/Skin-Disease-Diagnosis-Using-U-Net-and-StyleGAN2.git.

### Create a Virtual Environment

It is recommended to use a virtual environment to manage dependencies:

python -m venv unet\_env

source unet\_env/bin/activate # For Linux/Mac

unet\_env\Scripts\activate # For Windows

### 3. Install Dependencies

Install the required Python libraries:

pip install -r requirements.txt

Note: If the requirements.txt file is missing, manually install the libraries listed in the "Libraries and Frameworks" section.

### 4. Verify GPU Availability

Ensure that your system can access the GPU:

python -c "import torch; print(torch.cuda.is\_available())"

If True is returned, GPU is configured correctly.

## **Running the Notebook**

### 1. Open the Notebook

Launch the Jupyter Notebook environment:

jupyter notebook

Open the Unet-stylegan2.ipynb file from the browser interface.

### 2. Preprocessing the Dataset

Ensure the dermatological dataset is available in the required folder structure.

Modify the dataset path in the preprocessing section of the notebook if needed.

### 3. Synthetic Data Generation

Run the cells under the "Synthetic Data Generation" section to generate high-quality synthetic images using the StyleGAN2-UNet hybrid model.

Monitor outputs to ensure successful image generation.

### 4. Train the Classifier

Proceed to the "Classification Model Training" section to train the EfficientNet-B5 model.

Modify hyperparameters if required to suit your hardware.

### 5. Evaluation

Run the evaluation section to generate metrics such as F1-score, precision, recall, confusion matrices, and Class Activation Maps (CAMs).

Outputs will be saved in the specified directory or displayed inline.

## Outputs

1. **Synthetic Images**: Generated synthetic images will be saved in the outputs/synthetic\_images/ directory.
2. **Trained Model Checkpoints**: Model weights and configurations are saved in outputs/checkpoints/.
3. **Evaluation Results**: Metrics, visualizations (e.g., confusion matrices, CAMs), and logs will be available in outputs/evaluation/.

## Contact

For issues or queries, contact [meshram.mdm@gmail.com].