Skin Disease Classification Using YOLO

1 Introduction

Skin diseases affect millions worldwide and can range from mild conditions like acne to severe diseases such as melanoma. Early and accurate diagnosis is critical for effective treatment but often requires expert dermatologists, who may not be accessible everywhere. Automated skin disease classification using deep learning can assist healthcare professionals by providing fast, reliable preliminary screening.
In this project, we focus on classifying multiple dermatological conditions using the DermNet dataset, which includes diverse skin diseases such as:

- Acne and Rosacea
- Hair Loss (Alopecia and other hair diseases)
- Melanoma, Skin Cancer, Nevi, and Moles
- Light Diseases and Disorders of Pigmentation
- Herpes, HPV, and other STDs
- Nail Fungus and other Nail Diseases

The problem tackled is building an efficient and accurate classification model that can generalize well to new images and assist in teledermatology and clinical decision support.

2 Aim

To develop and evaluate a deep learning-based image classification model using YOLOv8 to accurately classify multiple categories of skin diseases from clinical images.

3 Methodology

- **Dataset:** DermNet dataset from Kaggle, consisting of labeled clinical images across 6 major skin disease categories.

- **Data Preparation:** The dataset was split into 80% training and 20% validation subsets to enable model generalization.
- **Model:** YOLOv8 classification model (`yolov8n-cls.pt`) was used as the base and fine-tuned on the dataset.
- **Training Parameters:**
  - Image size: 224×224 pixels
  - Epochs: 25
  - Batch size: 32
- **Training Environment:** Google Colab with GPU acceleration.
- **Evaluation Metrics:** Top-1 accuracy, Top-5 accuracy, loss, and confusion matrix.

4 Results

The trained YOLOv8 classification model achieved a Top-1 accuracy of approximately **83.2%** and Top-5 accuracy near **99%** on the validation set.
The confusion matrix showed strong differentiation between classes, indicating reliable multi-class classification performance.
The model is lightweight with fast inference, making it suitable for real-time applications in teledermatology.

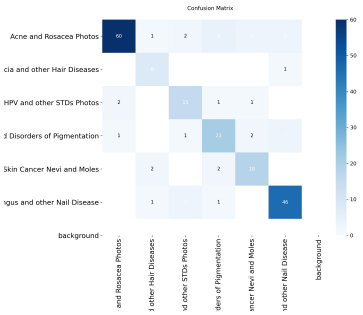

Figure 1: Confusion Matrix

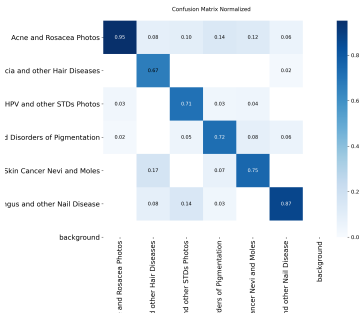

Figure 2: Normalized Confusion Matrix

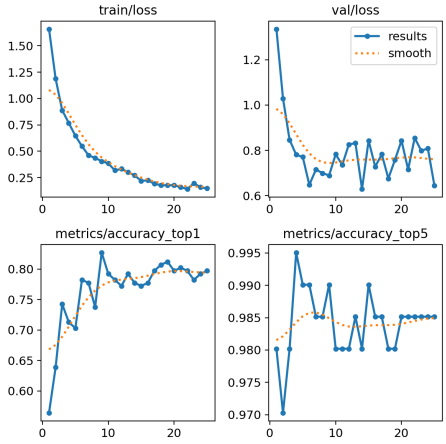

Figure 3: Results

Figure 4: Train Batch

Figure 5: Validation Batch

5 Conclusion

The YOLOv8 classification model demonstrated strong performance in classifying a diverse set of dermatological conditions from the DermNet dataset. Its efficiency and accuracy make it a promising candidate for real-time clinical applications, particularly in teledermatology and automated diagnostic support systems.

6 Team Members

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