

Skin Lesion Detection Project Report

1. Overview

This project implements a skin lesion classification system using deep learning. The goal is to allow users to upload a dermoscopic image of a skin lesion and receive the predicted lesion type. The project runs through a **Flask backend** and is **containerised with Docker**, so no additional software or Python environment setup is required.

2. Dataset

The model was trained using the **HAM10000** dataset, which contains dermoscopic images of skin lesions across seven categories.

Dataset link: <https://api.isic-archive.com/collections/212/>

Preprocessing

- Images were **centre-cropped** and then **resized to 256×256**.
- **Data augmentation** was applied on the training set to improve generalisation.

3. Model

The model used is **EfficientNetB0**.

- Transfer learning was applied.
- The **top 30 layers** of the network were **unfrozen** for fine-tuning.
- After training, **threshold tuning** was performed to find the best per-class decision thresholds that maximize the **F1 score** of each class.

4. Application Interface

The user interface is a simple webpage served through Flask.

- The user uploads an image.
- The backend preprocesses the image and runs inference.
- The predicted lesion class is displayed

Skin Lesion Detection Model

This model is designed to assist in the detection of common skin lesions. It can identify the following skin conditions:

- **akiec:** Actinic keratoses and intraepithelial carcinoma / Bowen's disease
- **bcc:** Basal cell carcinoma
- **bkl:** Benign keratosis-like lesions (solar lentigines / seborrheic keratoses / lichen-planus-like keratoses)
- **df:** Dermatofibroma
- **mel:** Melanoma
- **nv:** Melanocytic nevi
- **vasc:** Vascular lesions (angiomas, angiokeratomas, pyogenic granulomas, and hemorrhage)

For more information about the dataset (HAM10000), visit the [ISIC HAM10000 page](#).

Please upload a clear and focused image of the skin lesion to receive an AI-generated diagnosis prediction.

Choose file No file chosen

Predict

5. Deployment

The entire project is packaged using **Docker**, meaning:

- No external dependencies need to be installed.
- The application can be started using standard Docker commands.

6. Results

Model performance was evaluated after threshold tuning. A classification report and confusion matrix summarise how well the model performs across the seven lesion classes.

	precision	recall	f1-score	support
akiec	0.30	0.58	0.40	74
bcc	0.50	0.62	0.55	123
bk1	0.51	0.58	0.54	278
df	0.49	0.71	0.58	35
mel	0.48	0.55	0.51	262
nv	0.94	0.82	0.87	1558
vasc	0.76	0.78	0.77	41
accuracy			0.74	2371
macro avg	0.57	0.66	0.60	2371
weighted avg	0.78	0.74	0.76	2371
[[43 11 9 4 3 4 0]				
[19 76 6 3 9 7 3]				
[45 8 162 5 35 22 1]				
[2 1 1 25 2 2 2]				
[17 9 41 2 144 49 0]				
[17 43 96 12 108 1278 4]				
[0 3 3 0 0 3 32]]				

7. Conclusion

This project provides a functional skin lesion classification system using EfficientNetB0 and the HAM10000 dataset. Threshold tuning improved per-class F1 scores. The system is easy to run due to containerization, and the user interface allows image-based predictions.