

Team Name: Derma AI
Member: Syed Atif Shah
Age: 22
Education: College
Email: aatifshah15@gmail.com
Country/Region: Pakistan Khyber Pakhtunkhwa (KPK)

Problem Statement

Skin cancer has been reported as one of the frequently occurring cancers all over the world, but early detection has been a problem, particularly in developing countries such as Pakistan. High cost of consultation, short number of specialists or distance are factors that deprive many people access to dermatologists. Therefore, individuals tend to postpone a visit to the hospital in case they are not sure whether a skin lesion is serious or not.

Skin lesions are also hard to diagnose since the early cancerous lesions may appear as harmless ones. During manual diagnosis, a lot of reliance is on the knowledge of dermatologists and inaccurate interpretation or late visits can considerably lower the success of treatment.

Evidence: Dermatological screening has been shown to be a crucial factor in the survival of patients with melanoma, although not all regions have a high level of access to it, as IARC/WHO has indicated that in 2022, more than 1.5 million new cases of skin cancer were observed worldwide.

Purpose

DermaAI aims to increase the accessibility of early skin cancer detection, and it suggests AI-assisted diagnosis at home to users. The system minimizes confusion, and provides easy medical explanations, and directs the user to competent dermatologists in Pakistan. This makes one have the strength to approach medical care as soon as possible, enhancing reactions and enlightenment.

Proposed Solution

“We help individuals assess potential skin cancer risks by analyzing skin lesion images with AI and providing clear medical explanations and dermatologist recommendations.”

Key Features

- A fine-tuned EfficientNet model (7 lesion classes) is used to predict a skin lesion to the user after they provide an image of the lesion.
- The proposed condition is described in simplified and comprehensible language by an integrated medical reasoning engine (Google Gemini AI).

- The system proposes dermatologists in Pakistan according to the type of condition, location and specialization.
- The medical chatbot is a built-in feature answering follow-up questions regarding the identified condition.
- The summarized medical report is available to users as a PDF or DOCX file.

What's New

What people do today:

The majority of people use the late checkups, self diagnosis with Google search or no diagnosis at all as they are not educated or there are no specialists. The available AI solutions usually end at classification with no suggestions.

What's different about this approach:

One of such platforms is DermaAI which is a combination of AI image classification + LLM medical reasoning + dermatologist recommendations, and thereby, early direction is actionable and faster.

Feasibility & MVP

MVP (Completed Work)

The MVP is fully implemented and functional:

- Image upload Web Interface.
- efficiency EfficientNetB0 auto lesion classification.
- Confidence score display
- Google Gemini AI-generated explanation through LLM.
- PDF report generation
- Dermatologist recommendation module based on Pakistan CSV database.

Completed Implementation Summary:

- Flask API on the frontend upload interface.
- EfficientNetB0 inference pipeline combined.
- Integration of medical reasoning at LLM.
- System of dermatologist recommendation system works.
- PDF report creation working

Future Roadmap / Next Steps

1. **Improve Model Accuracy**

Train on larger datasets (HAM10000, ISIC)

2. Real-Time Camera Capture

- Allow mobile/web camera input
- Preprocessing for lighting and cropping

3. User Accounts & History Tracking

- Secure login
- Track scans, confidence, PDF reports, and risk patterns
- Re-check old scans with updated models

4. Cloud Deployment

- AWS/Render/Railway hosting with GPU-powered inference
- Cloud storage for reports/images

5. Mobile Version

- React Native or Flutter app
- Camera capture, offline preprocessing, push notifications
- Sync with web dashboard

6. UI/UX Enhancements

- Modern dashboard, step-by-step flow, dark mode
- Visualize risk patterns and progress over time

Top 2 Risks & Mitigation

Risk 1: The false interpretation of results as a medical diagnosis development.

Mitigation: No ambiguous disclaimers, AI limitations and focus on a visit to an actual dermatologist.

Risk 2: Hazardous forecasts due to low quality images.

Mitigation: provide image quality controls and risk taking lists on how to take the image well.

Success Metric

The proportion of users who can receive an AI analysis and follow-up guidance within less than 20 seconds after uploading an image is 70 percent.

Ethics & Inclusion

- Privacy: The images of the users are not kept but they are digested in a safe manner that guarantees confidentiality.

- Misuse prevention: the AI production particularly mentions that it is not a diagnosis of health condition.
- Preparedness: The interface has simple instructions, the interface is mobile friendly and each element has simple to follow explanation.
- Awareness of bias: The system recognizes the frailty of the data sets and encourages clinical validation of darker skin tones, where the global datasets lack.

References / Credits

- World Health Organization – IARC. *Skin Cancer Statistics*.
<https://www.iarc.who.int/cancer-type/skin-cancer/>
- Global Cancer Observatory (GLOBOCAN 2022). *Melanoma Incidence Worldwide*.
<https://pubmed.ncbi.nlm.nih.gov/39682020/>
- JAMA Dermatology. *Association of Tumor Thickness With Melanoma Mortality*.
<https://jamanetwork.com/journals/jama/fullarticle/2536642>
- Scientific Reports (Nature Publishing Group). *A comprehensive analysis of deep learning and transfer learning techniques for skin cancer classification*.
Demonstrates a high-performing CNN on public skin-lesion datasets (e.g., ISIC) with state-of-the-art sensitivity & specificity.
<https://www.nature.com/articles/s41598-024-82241-w>
- *Large collection of multi-source dermatoscopic images of common pigmented skin lesions*.
Kaggle Source: <https://www.kaggle.com/datasets/kmader/skin-cancer-mnist-ham10000>

AI Tools Disclosure

- **Claude AI:** It is applied to UI/UX design inspiration, such as advice on interface structure, color selection, space, element placement, and to general coding support, such as debugging recommendations.
- **Google Gemini AI:** It is used to create the medical explanation module to give supportive medical text outputs.

GITHUB Repo Link:

This GitHub repository includes the complete source code, system documentation, and full UI screenshots of the DermaAI.

<https://github.com/ATIFSHAH159/Derma-AI-Hoobit-International-Ideathon-2025>

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