A Project Report

On

**SKIN DISEASE DETECTION MODULE**

Submitted to

**IIMT COLLEGE OF ENGINEERING**

(Affiliated to Dr. APJ AKTU, Lucknow)

**Greater Noida**



In partial fulfilment of the requirements for the award of the degree of

Bachelor of Technology

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2023-24

**CHAPTER 1: INTRODUCTION**

**1.1 DEFINITION**

A skin disease detection model is an artificial intelligence (AI) or machine learning system designed to identify and diagnose various skin conditions based on images or other data. These models typically utilize computer vision techniques to analyse skin lesions, rashes, or other dermatological feature.

**1.2 OBJECTIVE**

The primary goal of the skin disease detection model is to accurately identify and classify various skin conditions from images, assisting healthcare professionals in early diagnosis and improving patient outcomes.

**1.3 BACKGROUND**

Skin diseases are prevalent and can significantly affect quality of life. Timely and accurate diagnosis is crucial, yet traditional methods often rely on visual assessments by dermatologists, which can be time-consuming and subject to human error. Recent advancements in machine learning and computer vision offer the potential to automate and enhance this diagnostic process.

Types of skin diseases:

* **Melanoma**
  + **Appearance: Asymmetrical shape, irregular borders, multiple colours (brown, black, tan, red), and a diameter larger than 6mm.**
  + **Key Features: Changes in size, shape, or colour; often appears suddenly.**
* **Eczema**
* **Appearance: Red, inflamed skin; may be dry and flaky; often appears on the face, neck, and inside of elbows/knees.**
* **Key Features: Itchy; can ooze or crust over.**
* **Basal Cell Carcinoma**
* **Appearance: Pearly or waxy bump; may have visible blood vessels; often pink or skin-coloured.**
* **Key Features: Slow growing; can develop crusts or sores that do not heal.**
* **Fungal Infection**
* **Appearance: Ring-shaped, red patches with clearer centers; scaly border.**
* **Key Features: Itchy; can occur on various body parts including scalp, feet, and groin.**
* **Rosacea**
* **Appearance: Redness on the cheeks and nose; may have visible blood vessels; small, red bumps.**
* **Key Features: Flushing and blushing easily; often worsens with heat, alcohol, or spicy foods**
* **Acne**
* **Appearance: Comedo (blackheads and whiteheads), papules, pustules, or cysts.**
* **Key Features: Commonly appears on the face, back, and shoulders; associated with oiliness.**
* **Vitiligo**
  + **Appearance: Loss of skin colour in patches; may affect any part of the body.**
  + **Key Features: Distinctly lighter areas on the skin; can occur alongside other skin conditions.**

**1.4 MODEL OVERVIEW**

The skin disease detection model utilizes deep learning techniques, specifically convolutional neural networks (CNNs), to analyse skin images. The model is trained on a diverse dataset comprising labelled images of various skin conditions, such as melanoma, eczema, rosacea, and others.

**Key Components:**

**Data Collection:**A comprehensive dataset is gathered, consisting of thousands of high-quality images annotated by dermatologists. This dataset includes a wide variety of skin types and conditions to ensure model robustness.

**Pre-processing:**Images are standardized through pre-processing steps such as normalization, resizing, and augmentation to enhance model training and performance.

**Model Architecture:**The CNN architecture is designed with multiple convolutional and pooling layers to extract relevant features, followed by dense layers for classification. Transfer learning may also be employed using pre-trained models to boost accuracy.

**Training and Validation:**The model undergoes rigorous training with cross-validation techniques to optimize its parameters. Performance metrics such as accuracy, sensitivity, specificity, and F1 score are used to evaluate the model’s effectiveness.

**Deployment:**Upon successful validation, the model can be deployed in clinical settings or as part of a tele dermatology platform, providing real-time assessments and recommendations based on user-uploaded images.

**CHAPTER 2: SURVEY OF TECHNOLOGIES/LITERATURE REVIEW**

**2.1 LITURATURE SURVEY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **Year** | **Authors** | **Methodology** | **Dataset** | **Key Findings** |
| 0. | 2016 | Mohanty et al. | CNN and transfer learning (VGG16) | Own dataset, 10,000 images | Demonstrated effectiveness of transfer learning for skin disease classification. |
| 1. | 2017 | Esteva et al. | CNN for image classification | ISIC 2016 | Achieved accuracy comparable to dermatologists in melanoma detection. |
| 2. | 2019 | Yu et al. | Deep learning with transfer learning (InceptionV3) | PH2, ISIC 2018 | Improved classification accuracy with pre-trained models, achieving 95% accuracy. |
| 3. | 2020 | Tschandl et al. | Multi-class CNN for skin lesion classification | HAM10000 | Developed a model with high sensitivity and specificity, outperforming existing methods. |
| 4. | 2020 | Kather et al. | Ensemble learning with multiple classifiers | 2D histopathological images | Achieved over 90% accuracy for classifying skin cancer types using ensemble techniques. |
| 5. | 2021 | Goyal et al. | CNN with data augmentation and hyperparameter tuning | Own dataset, ISIC | Enhanced model robustness with data augmentation techniques, improving accuracy by 10%. |
| 6. | 2022 | Almaraz et al. | Explainable AI techniques for model interpretability | ISIC, HAM10000 | Focused on model interpretability, showing how explanations could enhance clinician trust in AI predictions. |
| 7. | 2023 | Albahli et al. | Multi-modal deep learning (images + clinical data) | Clinical dataset | Improved accuracy by integrating clinical data with image analysis, demonstrating the importance of holistic approaches. |

**CHAPTER 3: SOFTWARE AND HARDWARE REQUIREMENTS**

**3.1 SOFTWARE USED**