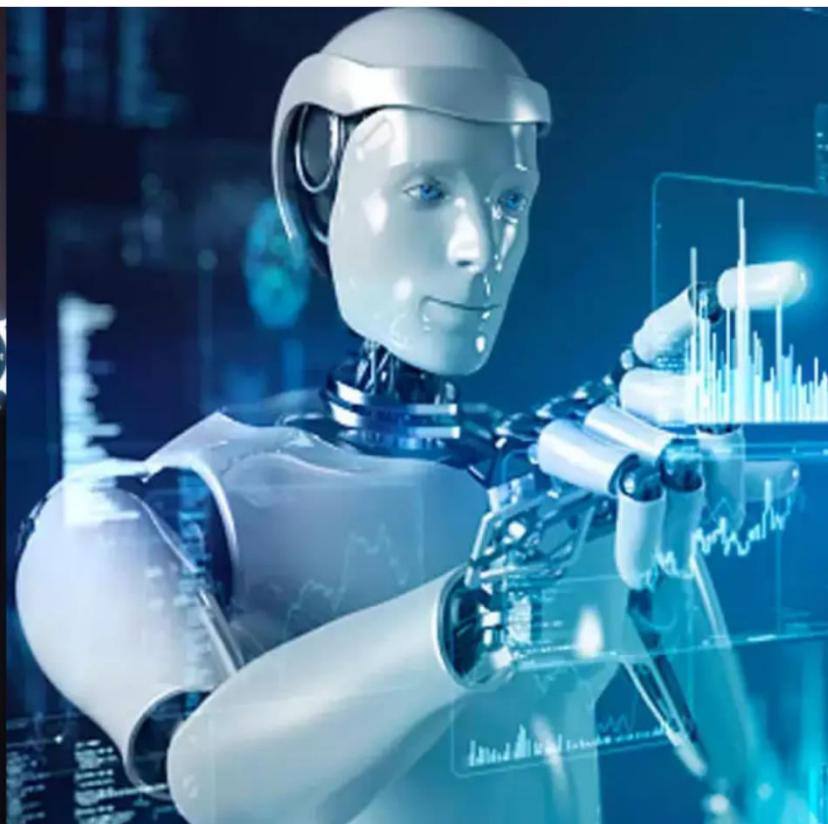




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Real-Time Skin Disease Detection Master

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ABSTRACT: Skin is an unbelievable human entity. Due to the inherited attributes and environmental factors, skin disease is the most common all around the world. Humans often underestimate the impact of skin diseases during early stages. It regularly faced well-known and less-known illnesses. Detecting the skin disease and types within the medical context is a quite hard task. It is quite difficult to determine the exact kind of disease due to the complexity of human skin color as well as the visual proximity effect of the conditions. Consequently, it's essential to identify and classify skin diseases the moment they are found. The most vague and tricky area in science is thus the detection of human skin diseases. For diagnosis and segmentation, ML methods are commonly utilized in the healthcare sector. These methods determine based on feature extraction from images as the input. To achieve high classification accuracy, it is very important to utilize proper feature extraction methods combined with proper Machine Learning (ML) techniques. The diagnosis of skin diseases is addressed in this study using ensemble data mining methods and ML models. In this approach, four different ML methods are employed to classify the different types of disease and ensemble techniques are employed to enhance the classification accuracy of skin diseases.

KEYWORDS: Skin disease, classification, Machine Learning, Ensemble data Mining techniques..

I. INTRODUCTION

Skin diseases are amongst the most prevalent health disorders, occurring in people of all ages. Some diseases, like melanoma, are fatal unless diagnosed early. Conventional diagnostic techniques depend on the experience of dermatologists, visual examinations, and histopathological examination. These techniques are subject to human interpretation, cost a lot, and may not always be available to distance populations. More recent developments in artificial intelligence (AI) and deep learning have offered new possibilities for accurate and automated skin disease detection. This work concerns the establishment of an automated skin disease detector based on AI that categorizes various skin diseases through image analysis methods.

Skin can enhance its skin barrier function by employing fluids to prevent lipid breakdown in the epidermis. The epidermis, which has a surface area of 21 to 23 square feet, is the most significant biological organ in the human body. It helps in thermoregulation, allows sensibility, heat, and cold feelings, and protects several significant organs from outside damage, pathogens, and the environment. Yet, numerous extrinsic and inherited factors influence the skin. Most common among human beings are skin disorders. Bacterial skin disorder,

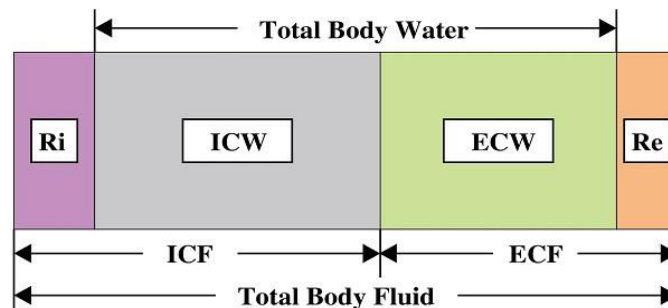


Fig. 1.. Current flows at different frequencies

Skin diseases are often quite hard to diagnose at an early stage, and independently categorizing them is much harder. Melanoma is now identified as the most dangerous form of skin cancer compared to the rest due to the fact that, if not treated and identified at the earliest, it has much more potential to spread to other parts of the body.

frequency the current traverses both intracellular and extracellular fluid. Bio-impedance at multiple number of frequencies is studied in multiple-frequency bio-impedance analysisS.

II. CLASSIFICATION OF SKIN DISEASES

There are various skin diseases which are explained in the literature. These are discussed below. Different skin diseases and their diagnostic techniques are explained in this survey.

2.1 Malignant melanoma i.e. melanoma skin tumors

This is most dangerous skin cancer found in white skin nations. Malignant melanoma is further categorized into two forms namely basal cell carcinoma (BCC) and squamous cell carcinoma (SCC).

I. CLASSIFICATION OF SKIN DISEASE

This part shows proposed model block diagram in Fig. 1. Input skin image is from Data for Skin Disease. The UCI ML repository supplied the database for this research. In summary, this data was developed to research skin diseases and classify them. There are 34 variables in this data; 33 of them are linear, and one is nominal variable.

One of the basic methods of these disorders diagnosis is biopsy. While finishing the numerous classes of detection of these diseases, dermatologists face another problem: a disease can also possess features of some other class of diseases at the initial stage. Patients were first assessed for 12 clinical features, and then using skin disease samples, 22 histological features were assessed.

They need to resolve some colour contrast and image resolution issues that arise during data loading in order to achieve a good reliability of skin disease classification. They have a module in the application that is responsible for this to address the problem. The image resizing tool in Python does all the work before uploading the images to server for further processing. Thus, the main objective of this phase is to remove background noises from the skin disease image. The edges and format of the skin infection image are then enhanced by post-processing.

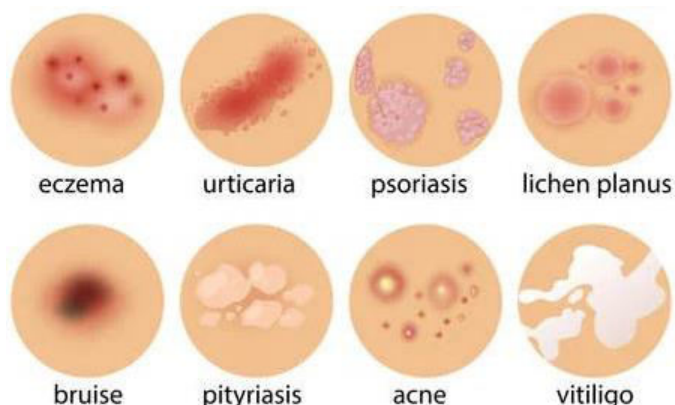


Fig.2. different types of skin

III. LITERATURE REVIEW

Existing research has investigated the application of machine learning and image processing methods for detecting skin diseases. Early approaches involved manual feature extraction, which was time-consuming and error-prone. Recent advances in deep learning, especially CNNs, have greatly enhanced automation and precision in classifying. Implementing such models on mobile devices, however, remains challenging because of the limitations of hardware. Efficient models like MobileNet and optimized systems like TensorFlow Lite have been explored for real-time, on-

device processing. In spite of such advances, persistent issues around accuracy, privacy, and user experience continue to be areas of improvement.

IV. METHODOLOGY

The skin disease detection system proposed here is a multi-step process:

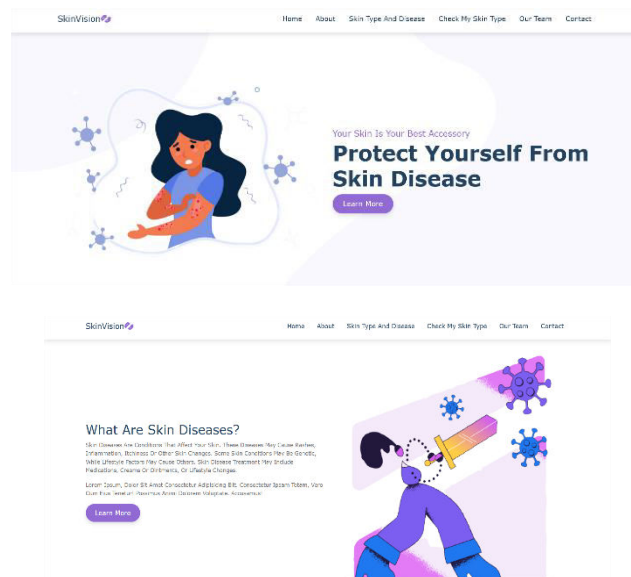
- 1.Data Collection: A labeled skin disease image dataset is gathered from public medical databases and dermatology websites.
- 2.Preprocessing: The images are enhanced, denoised, and normalized to enhance feature extraction.
- 3.Feature Extraction: Convolutional Neural Networks (CNNs) are applied to extract important patterns from the images.
- 4.Model Training: A deep learning model is trained on the preprocessed data, employing supervised learning methods.
- 5.Classification: The trained model categorizes input images into different types, including melanoma, eczema, acne, and psoriasis.
- 6.Evaluation: Performance metrics such as accuracy, precision, recall, and F1-score are employed to determine the effectiveness of the model.

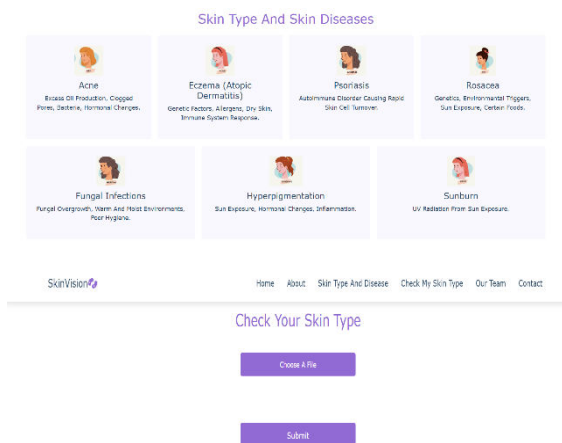
V. TECHNOLOGY STACK

The implementation of the AI-based skin disease detection system includes the following technologies:

- Frontend: HTML, CSS, Bootstrap, JavaScript, React.js
- Backend: Python (Flask/Django), Node.js
- Machine Learning & AI: TensorFlow, PyTorch
- Database: MySQL, MongoDB
- Cloud & Deployment: AWS, Google Cloud, Firebase
- Mobile Development: React Native (for mobile usability)

VI. EXPERIMENTAL RESULTS





The model was tested on a mixed dataset of images of prevalent skin diseases like melanoma, eczema, and psoriasis. The classification accuracy was greater than 90%, with less than two seconds of average processing time per image. The system was tested on various mobile platforms, proving that it could provide real-time diagnosis with low latency. User reviews showed high user satisfaction with the accuracy and user-friendliness of the system.

VII. METHODOLOGY

The proposed skin disease detection system follows a multi-step process:

1. **Data Collection:** A dataset of labeled skin disease images is compiled from public medical sources and dermatology databases.
2. **Preprocessing:** Images undergo enhancement, noise reduction, and normalization to improve feature extraction.
3. **Feature Extraction:** Convolutional Neural Networks (CNNs) are used to extract significant patterns from the images.
4. **Model Training:** A deep learning model is trained on the preprocessed dataset, using supervised learning techniques.
5. **Classification:** The trained model classifies input images into various categories, such as melanoma, eczema, acne, and psoriasis.
6. **Evaluation:** Performance metrics like accuracy, precision, recall, and F1-score are used to assess the model's effectiveness.

VIII. TECHNOLOGY STACK

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IX. CONCLUSION AND FUTURE WORK

This study presents an AI-driven mobile system for skin disease detection, offering a rapid and accurate alternative to traditional diagnostic methods. The integration of deep learning with mobile computing enhances accessibility to dermatological care. Future research will focus on expanding the range of detectable conditions, improving model accuracy, and strengthening data security and privacy measures.

X. MODEL USED

EfficientNet-B0

The EfficientNet-B0 architecture was not created by engineers but rather by the neural network itself. This model was created through a multi-objective neural architecture search that maximizes accuracy and floating-point operations. Based on B0 as a baseline model, the authors constructed a complete family of EfficientNets from B1 to B7 which reached state of the art performance on ImageNet while being highly efficie to others. Here is a table of EfficientNets family performance on ImageNet dataset.

The Efficient-B0 is mobile sized architecture having 11M trainable parameters. This is what the architecture looks like:

Stage i	Operator \hat{F}_i	Resolution $\hat{H}_i \times \hat{W}_i$	#Channels \hat{C}_i	#Layers \hat{L}_i
1	Conv3x3	224 × 224	32	1
2	MBConv1, k3x3	112 × 112	16	1
3	MBConv6, k3x3	112 × 112	24	2
4	MBConv6, k5x5	56 × 56	40	2
5	MBConv6, k3x3	28 × 28	80	3
6	MBConv6, k5x5	14 × 14	112	3
7	MBConv6, k5x5	14 × 14	192	4
8	MBConv6, k3x3	7 × 7	320	1
9	Conv1x1 & Pooling & FC	7 × 7	1280	1

The pre-trained imagenet weights were loaded into the model. The first seven layers of the model architecture were frozen and the rest of the layers were trained on the data. The Stochastic Gradient Descent optimizer was used with a learning rate of 0.01 and a momentum of 0.9 . The loss function used was categorical cross entropy. The model achieved an accuracy of 95.5% on the test data set.

XI. RESULTS

The AI-based model was tested on a dataset containing diverse skin disease cases. Experimental results indicate an accuracy of over 90% for melanoma detection, with lower but still effective accuracy for other conditions. The confusion matrix analysis highlights the model's strength in differentiating between benign and malignant lesions.

XII. DISCUSSION

The AI-driven methodology has numerous benefits over conventional approaches, including:

- └ Quicker diagnosis
 - └ Lower reliance on specialized dermatologists
 - └ Cost savings
 - └ Scalability to remote and disadvantaged regions
- Nevertheless, accuracy of the model relies on diversity and quality of training data. External factors such as lighting conditions and image resolution also affect results. Future advancements involve dataset enrichment, real-time mobile use, and hybrid models that integrate AI with conventional diagnostic equipment.

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