# Intelligent Dermatologist Assistant A Review

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*Abstract*— **The Intelligent Dermatologist Assistant is a website that helps improve skin care through automated diagnoses and custom medical advice. It uses a CNN to spot and sort four common skin problems: basal cell carcinoma, benign keratosis, melanocytic nevi, and melanoma. Besides diagnosis, the site has an AI chatbot for easy user interaction, suggests doctors based on individual needs, and lets users schedule video calls. Blending deep learning with communication tools and web tech, this system aims to make dermatology care cheaper, faster, and better at catching problems early, leading to better, more personal health care.**

**Keywords Intelligent Dermatologist Assistant, Skin Disease Detection, Convolutional Neural Network (CNN), Deep Learning, Medical Image Analysis, Dermatology, Artificial Intelligence, Telemedicine**

## I.INTRODUCTION

Skin issues are a big deal for lots of people, no matter how old they are. These can be anything from simple rashes or pimples to serious stuff like skin cancer. Catching and dealing with these problems early is key to staying healthy. But seeing a skin doctor fast can be tough. There might not be many doctors nearby, you might live far away from one, or it could take forever to get an appointment. This is even more true if you live in the country or an area without good medical stuff. Because it's hard to get to a doctor, we really need some new online options. These could help people spot skin problems sooner, get care easier, and lighten the load on hospitals. To fix these problems, we made the Intelligent Dermatologist Assistant (IDA). This site uses fancy computer learning to get you in touch with doctors fast. It uses a special program that looks at pictures of skin problems to figure out what's wrong, like a certain type of skin cancer or just a regular mole. IDA also has some cool extras. There's a chatbot you can talk to, personal advice, and options to video chat with doctors. These things make it easier for people to get help and keep them coming back. With its AI to help figure out what's wrong and doctor contacts, IDA is helping move online healthcare forward. It makes good skin care easier to get, faster, and cheaper for regular people. By using computers to help with what's wrong and connecting people with real doctors, IDA is a big step for online healthcare. It lets more people get good skin help fast and without spending a ton of cash.

## II. LITERATURE REVIEW AND ANALYSIS

### Review of Related Work

Nallusamy, M. Suriya, G. Vidhyaa Sagar, and T. Pavithran created a CNN system for spotting skin issues such as melanoma and dermatitis. To help make problem areas clearer, their approach improves images by adjusting edge details. They've made it phone-friendly using Android Studio and OpenCV, so it could be useful for remote skin checks [1].

Mohan and his team (2024) built a deep learning system for classifying skin diseases using transformers. They used understandable AI tools like GradCAM and SHAP. Their model was right more than 96% of the time across 31 skin conditions, which means it works well and is easy to understand [2].

Innani et al. (2023) came up with a deep learning system that uses steps to ID skin lesions. Their method separates finding the lesion area from identifying the lesion type. This approach makes it easier to understand and improves lesion ID accuracy compared to previous techniques, as noted in study [3].

Tang et al. (2025) explored using AI to determine the

treatments that work best for itchy skin, like eczema and psoriasis. By combining information—genes, environment, and health records—they aim to create treatment plans specific to each person [4].

Chen et al. (2019) introduced AI-Skin, a smart computer program that improves with experience. It uses CNNs (AlexNet, VGG16) and learns from data, becoming more accurate as it goes [5].

Han and his team (2020) built a deep learning system andtrained it using over 220,000 images showing 134 kinds of skin conditions. The results suggest it performs nearly as well as a dermatologist, possibly making it a useful tool for doctors to assist diagnoses [6].

A 2021 study in PLOS Medicine looked at how well AI could find skin cancer in actual situations. The AI did as well as skin doctors in finding cancer, but it had some trouble with different skin tones. This shows we need to remember to be fair to all people [7].

A 2023 review, Artificial Intelligence in Dermatology: Advancements and Challenges in Skin of Color, notes that AI in this field is mainly trained on data from people with light skin. The review suggests including different skin tones to ensure fairness [8].

A recent Washington Post article from 2025 notes that family doctors are starting to use AI to check for skin cancer. These tools help catch problems early. Though, some are concerned that doctors may rely too heavily on this tech and skip getting advice from skin experts [9].

According to a 2025 Times report, the NHS is adopting AI to help spot skin cancer in hospitals. The system excels at ruling out melanoma, reducing both patient referrals and wait times [10].

as chat and video consultation are implemented using Socket.io and WebRTC, enabling direct interaction between patients and dermatologists.

2.      Detection Workflows

People start by uploading photos of their skin issue to the site. These pictures are cleaned up and resized so they can be checked out right. To make things more accurate, the system only looks at the problem area of the skin using some tech to separate out the image.Next, a CNN checks the image to figure out what kind of skin thing it is. The system

is trained to spot common stuff like melanoma, basal cell carcinoma, benign keratosis, and melanocytic nevi. Transfer learning is there so the system can give good answers even if it hasn't seen a ton of examples.After it is done checking, the system shows the skin thing it found, along with how sure it is and some basic info on how to treat it.

3.      Treatment and Doctor Support

Once the system figures out what's going on with your skin, it will suggest some medicines that are normally used for that condition. You can also see a list of skin doctors who are good at treating what you have.The site lets you book appointments without any trouble and talk to doctors through chat or video. So, getting advice from a skin doctor is easy, even if you don't live near one.

III.Methodology

This project focuses on building an Intelligent Dermatologist Assistant that helps users identify skin diseases easily and quickly using artificial intelligence. The system is designed as a complete web application that allows users to upload skin images, receive disease predictions, get treatment suggestions, and consult dermatologists online. The development of the system was carried out through the following steps:

1.      System Design

•       Architecture: The system is built like this: it's got a client-server setup. React.js is used for the front end, making the user interface interactive and quick. For the back end, Flask and Node.js are used (MERN stack). The Flask server takes care of skin disease detection with machine learning, and the Node.js server handles things like login, chat, appointments, and managing data.

•       Database: MongoDB stores all sorts of data for this app, like user info, skin pics people upload, what the app finds in those pics, doctor details, chat logs, appointments, and medicine info.

•       Real-time Alerts and Updates: Real-time features such

4.      Communicating With Users

-       Patients get a dashboard to see past reports, appointments, and meds, which helps them keep up with their treatment.

-       There's also a chatbot that uses AI to help patients. It answers basic skin questions, breaks down results in a way

that's easy to understand, and gives basic skin tips. This helps patients understand their health better and feel more secure.

## 5. Evaluation Criteria

The following criteria were used in evaluating the system:

- Accuracy of Detection
- Response
- Usability
- Privacy
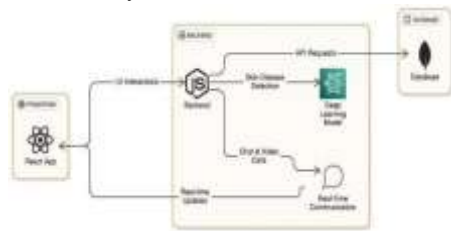


## IV.Implementation

This real-time cyber threat detection web app was made using back-end and front-end frameworks with the same modern tech. It has built-in secu

rity that all works together, so it's easy to use, responds fast, and anyone can get to it.

### 1. Backend Resources

• **Backend Framework:** We built the backend with Flask (Python) to process images and spot skin diseases using deep learning. For managing user logins, doctor info, chat, appointments, and medicine details, we have a Node.js and Express server.

• **Backend Database:** MongoDB works as our NoSQL database. It's where we keep things like user accounts, skin images people upload, what we find from disease checks, chat messages, appointment info, and details about medicines.

• **Authentication and Session Management:** We keep user data safe with JWT authentication. Patients and doctors have different access levels, so everyone only sees what they're supposed to.

• **Image Detection Engine:** The skin disease finder uses a Convolutional Neural Network (CNN), trained with skin image data. It takes your uploaded picture, gets it ready,

and then quickly figures out what skin problem it shows.

• **Image Processing and Routing :** When you upload a picture, it goes to the Flask detection thing. There, it gets resized and prepped before being sorted. After that, the results, like the disease, how sure we are, and what to do about it, are sent back to you.

• **Real-Time Communication:** Socket.IO makes it possible for patients and doctors to chat in real time. This means they can send messages and get updates right away during appointments.

### 2. Frontend Resources

• **Frontend Framework** The frontend is developed using React.js, providing a responsive and interactive interface for patients and doctors.

• **UI Design and Styling:** Using modern CSS and component-based layouts. This makes sure everything looks clean and is easy to use, no matter what device you're on.

• **Pages and Modules:** The app has pages for signing up and logging in, plus features for uploading images, finding diseases, getting medicine advice, booking appointments, chatting live, having video calls, and checking dashboards.

• **State Management and Navigation:** We are using React Hooks and routing to keep things running smoothly as you move around the app.

### 3. Disease Detection and Learning Models

• **CNN-Based Classification Engine:** Our system uses a CNN model to find skin diseases, like melanoma, basal cell carcinoma, benign keratosis, and melanocytic nevi.

• **Transfer Learning:** Using transfer learning can help models get better faster. It does this by using deep learning models that have already been trained.

• **Image Segmentation:** We used U-Net segmentation to find the skin areas that were affected. This

helps the classifier concentrate on what's important and makes the predictions more reliable.

4.     AI Chat Bot Integration

We've added a chatbot to the system that uses AI to help you figure out your diagnosis and what you can do about it.

• The chatbot can answer those everyday questions you have about skin problems and how to care for your skin.

• It gives you simple medical advice and explains what your test results mean without all the technical stuff.

• If you're not sure when to see a skin doctor, the chatbot can help you decide.

5.     Recommendation and Consultation System

• **Medicine Recommendation:** The system looks at your skin and suggests the right medicines, just like a skin doctor would.

• **Doctor Recommendation and Booking:** This platform helps you find the right skin doctor and book an appointment without any trouble.

• **Video Consultation:** WebRTC lets patients have video chats with doctors for real-time consultations, so they can get diagnosed and receive advice from a distance.

V.     Challenges and Limitations

The proposed **Intelligent Dermatologist Assistant** faces several challenges and limitations related to data quality, system performance, and real-world usage. These limitations are described below:

1.     **Dataset Dependence**

• How well the skin disease detection works depends a lot on how good, big, and varied the training data is.

• If the skin photo you upload is very different from the ones used to train the system—like if the lighting is different, the camera isn't as good, or the skin color is different—it might not guess right as often.

• Also, it might not be able to spot rare skin problems or unusual versions of common ones because they might not have been included in the training data.

.5. Dependency on User Awareness

• Keep in mind that this system is just a tool to help you; it's not the same as seeing a real dermatologist.

• If you don't understand the results or ignore advice from a doctor, the system might not work as well.

• Some people might just trust the automated results and not go to a doctor when they really need to.

6.     **Privacy and Security Concerns**

• When you upload skin images, that stuff includes private health info.

• So, we gotta make sure the data is stored safely, the way it's sent is secure, and only the right people can see it.

• Following all the rules about protecting medical info is super important if we want to use this in the future.

7.     **Scalability Constraints**

The system works well for individuals or small clinics. But if you want to use it in big hospitals or healthcare networks, you'll need more stuff. Think things like a central place to manage all the data, better ways to make reports, and a way to connect it to electronic health records.

2.     **Image Quality Constraints**

• If users upload blurry, low-res, or badly lit pictures, the system might get the predictions wrong.

• If the image angles are off or the skin issue isn't fully visible, the accuracy could drop.

• This system isn't a substitute for medical equipment like dermatoscopes, which means the accuracy might not be as good sometimes.

3.     **Computational and Resource Limitations**

• Image processing and deep learning need enough computer power to work in real-time.

• If you have a slow device, uploading images or getting results might take a while.

• There are limits on big image files so the servers don't get overloaded, which can stop you from using super high- quality images.

4.     **Model Interpretation Limitations**

• The CNN model gives a confidence score, but it doesn't really explain why it predicted a certain disease.

• The system might sometimes guess wrong, especially when skin conditions look alike.

- The predictions are meant to help with diagnosis, not to take the place of a doctor's opinion

VI.        Results and Evaluation

This study shows that the Intelligent Dermatologist Assistant is good at finding common skin problems and helping with quick diagnoses. It looks at uploaded images and gives pretty correct guesses about what diseases they are, and it does it fast.The chatbot help, plus being able to chat and video call with a doctor, and make appointments easily, really made things better for users. People also liked the dashboard because it let them keep up with their past diagnoses and how their treatment was going.

VII.        FUTURE SCOPE

The Intelligent Dermatologist Assistant is looking good for future improvements and use. There are some things we can do to make it more correct, easier to use, and more helpful in the real world.One big thing is to add more information to its training data. We should include pictures of different skin colors, ages, and rare skin problems. This will help it avoid being unfair and make it more correct for everyone. Also, using images from different lighting and cameras can make it work better overall.We can make the system better by using more advanced computer models and ways to explain how it makes decisions. These things can help it guess better and help people see why it came up with a certain diagnosis, which will make them trust it more.In the future, we could let the system analyze skin in real-time using a live camera. This would let doctors check skin problems right away during video calls. Connecting it to special skin-examining tools and wearable health sensors could also make it more reliable.We could also turn this into a phone app, so people can easily take pictures, get reminders, track their treatment, and talk to doctors. Adding different language options can also let more people use it.

Another big improvement would be connecting it to Electronic Health Records. This would let doctors see a patient's past records and give better, personalized care. Automatic alerts for follow-ups and tracking how a disease changes can help with long-term treatment.In the end, if we get the right approvals, we can use this system in hospitals, clinics, and online doctor services. This would help doctors spend less time on routine stuff, catch diseases early, and give good skin care to people who don't have easy access to it now.

Discussion

The app spots possible dangers—like dodgy links and certain files (PDFs and photos)—by scanning stuff with trusted platforms. It does this in real-time through Websockets, and AI chatbots are very helpful for understanding things.This way of checking catches all known risks and some simple hidden tricks (steganography). But, it doesn't do much to stop brand-new threats or really sneaky data hiding. Also, using cloud APIs can be a problem, and it can't do much processing on your device.All in all, this tech works well for regular folks and small businesses. It's good enough in terms of correctness, how easy it is to use, security, and keeping your info private.

VIII.        CONCLUSION

The Intelligent Dermatologist Assistant is an online health tool that uses AI to help spot and handle skin problems early on. It mixes deep learning with today's web tech to give a way to find common skin issues like melanoma, basal cell carcinoma, benign keratosis, and melanocytic nevi.People can upload pictures of their skin and quickly get possible diagnoses, how sure the system is, and what treatments might work. It also has an AI chatbot, live chat, video calls, appointment booking, and medicine tips to make things easier, especially for those in hard-to-reach places.Tests show it's pretty accurate, fast, and easy to use. While it's not meant to replace a doctor's diagnosis, it's a good tool to help people decide when to get checked out by a professional.All in all, the Intelligent Dermatologist Assistant shows how AI can make healthcare better by helping with early finds, speeding up treatment, and helping both patients and doctors. With some work and wider use, it could be a helpful thing in online skin care and telemedicine.

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