SKIN SAFE AI: A Skin Disease Classification and Segmentation from Smartphone Images

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Abstract—The problem of skin-related issues and the damage caused by ultraviolet radiation has been recognized as a significant health concern due to environmental and lifestyle factors. The early diagnosis and prevention of these issues are sometimes hampered by factors such as accessibility, the cost of diagnosis, and a lack of understanding of the environment. This paper proposes Skin Safe AI (Derma Care), which is an AI-assisted mobile application that has the potential to automatically diagnose skin problems and utilize real-time information about ultraviolet radiation exposure. The proposed system integrates image capture from smartphones, classification algorithms based on deep learning concepts, environmental data capture, and personalized skin care advice using a cross-platform React Native technology. The effective decision-making and risk analysis enable real-time feedback and prevention. The experimental results demonstrate that the integration of visual analysis and environmental data has the potential to improve active skin care.

I. Introduction

Skin care is an essential part of a person's health, but it is usually overlooked until it becomes a serious issue. The difficulty of detecting skin problems, from simple irritations to life-threatening diseases, is a complex process that requires professional knowledge, which may not always be readily available. Moreover, environmental conditions such as Ultraviolet (UV) rays are the main causes of skin problems, but most people do not have the capability to measure the risks associated with their surroundings.

Current mobile health applications are usually disjointed, providing either image classification or basic weather monitoring capabilities, but not combining these elements to form a comprehensive health strategy. This creates a gap between unorganized self-diagnosis and the absence of preventive strategies against sun damage.

To fill this gap, this paper introduces Skin Safe AI (Derma Care), a centralized AI-powered mobile application for internal skin health management. This application combines image processing, environmental analysis, and routine management into a single interface. By utilizing computer vision and real-time APIs, Skin Safe AI (Derma Care) enables users to instantly analyse risks, predict recoveries, and develop personalized skin care regimens.

II. Literature Review

The development of Artificial Intelligence (AI) in the field of dermatology has shown tremendous growth in the past few years due to the advancements in computer vision methodologies. Research has shown that a major portion of the research carried out in the field of AI and dermatology has been focused on the application of image classification methodologies for the identification of various abnormalities that are related to skin problems. Out of all the image classification methodologies that are used for the identification of various abnormalities related to skin problems, the application of deep learning methodologies, specifically Convolutional Neural Networks (CNN), has shown the best results for the identification of various types of skin problems, such as melanoma, acne, eczema, etc.

However, it is observed that the majority of the research carried out in the field of AI and dermatology has been focused on the identification of various abnormalities related to skin problems in a controlled environment, while there is no such emphasis on the identification of the various problems that are faced by our skin in real-world scenarios. Specifically, the environmental factors such as UV rays, humidity, temperature, etc., are not taken into consideration while performing the research studies carried out in the field of AI and dermatology, as these factors play an important role in the identification of the problems faced by our skin. Moreover, there is no such emphasis on how these factors can be taken into consideration while performing the research studies carried out in the field of AI and dermatology, as it is observed that these factors play

an important role in maintaining our overall health, specifically the health of our skin.

Parallel to these advancements, different types of learning management systems and health tracking systems have also been developed. However, these are just static repositories of information, without much adaptability being provided within the system. The absence of dynamic interaction systems makes these types of systems less effective. For an effective preventive healthcare system, feedback loops and decision-making mechanisms are always essential. However, static systems do not provide these benefits.

Though mobile health technologies have gained much importance and recognition as an effective tool in preventive healthcare systems due to their ease of use and convenience, most of the mobile health technologies are highly dependent on user inputs.

III. PROBLEM STATEMENT

Skin health management is mostly reactive. Users' motivation to seek care is frequently driven by the visibility and severity of symptoms and is often delayed until the symptoms are critical. This can result in the escalation of medical conditions and discomfort, or even unnecessary complications. While skin health is heavily impacted by environmental factors such as ultraviolet (UV) radiation, temperature, and weather conditions in our daily life, the typical user does not have the means to understand how these conditions affect their skin or how to take preventative actions.

On the other hand, skin-related concerns usually first manifest as visible differences in appearance. However, a layman user is unable to interpret the nature of the concern, the severity of the symptoms, or the downstream impact. This results in inaction or self-management that is not well-informed. The lack of a holistic solution that can bridge the correlation between visual assessment, environmental condition, and actionable guidance results in a gap between early symptom detection and a well-informed decision.

The problem this solution is solving is the lack of a cohesive and proactive solution for skin health management that enables early detection of potential concerns, awareness of environmental risks, and easy-to-understand, credible recommendations. The solution should ensure accuracy, and guarantee usability and accessibility in an everyday scenario.

IV. EXISTING AND PROPOSED SYSTEM

A. Existing Methods and Limitations

Old ways to judge if your skin is healthy have two parts. The first part is going to see a skin doctor in person, and the second part is using apps on your phone that give you general information about skin care without linking it to you or where you are. The old way is to make an appointment to see a medical person who knows about the skin. They look at your skin and then tell you what to do. This way is medical and true most of the time. The problem with this way is that it costs a lot of money, you have to wait a long time for an appointment, and it's not easy for everyone, especially people who live far from places with lots of skin doctors. The other problem with this way is that you can't see a skin doctor all the time, so it's hard to catch problems early or prevent them before they get bad.

B. Need for an Automated Approach

Manual observation and conventional consultation based approaches are not scalable or continuously accessible. Users need an automated approach that can provide just-in-time insights without continuous clinical intervention. Moreover, evaluating the joint influence of visual skin indicators and environmental factors is not practical through existing approaches. An intelligent automated approach is thus needed to provide real-time analysis, contextual risk assessment and personalized preventive guidance.

C. Proposed System

The proposed skin health assessment and preventive UV care guidance system is an intelligent mobile-based application, Skin Safe AI (Derma Care). The system enables the user to take or upload images of the skin through the smartphone interface. The images captured are run through an AI-driven multi-class classification logic that identifies potential conditions, severity indicators and confidence levels.

For contextual awareness, the system is integrated with environment intelligence services through API mechanisms. Real-time atmospheric parameters such as UV Index, Humidity, Temperature etc. are obtained from these external sources and updated through a risk evaluation model. Dynamic safety scores are generated, and adaptive preventive recommendations are provided, based on the inputs derived from both the vision and environment. The resulting analysis, safety warning and skincare guidance are presented to the users through an interactive mobile interface supported by accessibility features.

D. Advantages of proposed system

This system is user-oriented as skin health monitoring and recommendations are fully automated. Rather than providing static recommendations, it is capable of providing situation-aware recommendations by integrating information regarding the current surrounding environment through the data sensor. The automatic classification and risk evaluation reduce direct and continuous clinical dependency, and improve users' awareness toward risky conditions at early stages to take preventive measures and seek medical attention when necessary.

The modularized nature of system architecture will enhance system maintainability and scalability to add further enhancements without impacting the current infrastructure.

Incorporating accessibility features such as TTS enhances usability for more users. Automated and situation-aware recommendation delivery increases convenience, preventive healthcare consciousness, and decision support.

V. SYSTEM ARCHITECTURE

Skin Safe AI (Derma Care) is the proposed system that is designed with the help of a Model-View- Controller architecture paradigm that ensures a high level of modularity, scalability, and maintainability. The architecture paradigm that has achieved the highest popularity is the Model-View-Controller design pattern which promotes separation of concerns hence maximizing flexibility, efficiency, ease of maintenance and enabling the system to be expanded without compromising the stability of the system.

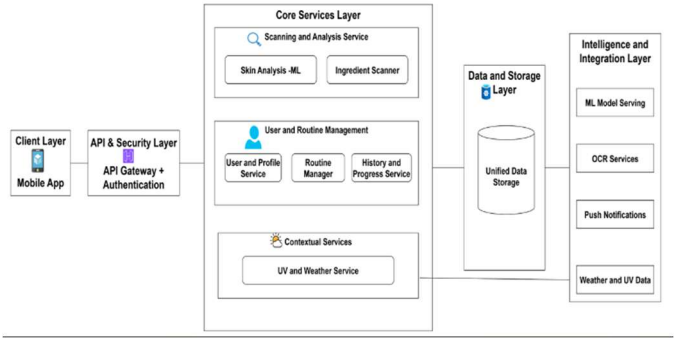
The View in the proposed system is to render a graphical view as well as made actions on user interface and experience with the system. This View layer is created with React Native and Expo Router and offers a very responsive cross-platform mobile interface. Screen navigation to various functions is through a filebased routing system and shows dynamic content such as skin analysis, safety, and preventive care contents in addition to overseeing user interactions such as the acquisition of pictures, skin, scanning, and other interaction related screens that is very responsive and consistent across various devices and the varying size of the screen.

The proposed system has the Controller component that lies between the View and Model Components and, therefore, guarantees a very high level of efficiency in the workflow between the various system components. Examples of user-generated events that the Controller accepts include the image acquisition and scanning, which is then sent to other system elements to be processed including image preprocessing and classification. Managing interactions of external data sources, such as accessing real-time environmental data, such as the UV Index, humidity, and temperature, through API requests is also managed by the Controller, which makes it a highly efficient system that is also working in a dynamic and changing environment but has well-structured and organized output.

The Model component entails the data structures, the computer computing components, and the data persistence components of the Skin Safe AI (Derma Care) system. It takes responsibility to store the image data, classification results, the severity and level of confidence, the environmental parameters and all other things that might have been accomplished during analysis. Moreover, this component takes control of the system state, the session management as well as the security to ensure efficiency in the user session.

Other intelligence services that are closely related to the system in real time are environmental services which use API driven mechanisms to provide current atmospheric parameters. Such parameters in the atmospheric conditions form the foundation of contextual risks assessment and safety scoring calculations. This component also transports the information in the external environmental services and forwards the information to the Model components to be processed in accordance with the evaluation algorithms, and the required computational logic. In this way, by taking into account the pertinent external data, the system will be able to change its decision-model in response to the received environmental data, which will lead to more situational and precise preventive advice.

Depending on the levels of systemic risks, the system has the ability to personalize the warnings on sun exposure, required protection measures, and sun care advice. As such the program is not a rigid diagnostic measure but rather used in conjunction with the surrounding and can react dynamically to the dynamic in the setting. The MVC architectural design will ensure that the dynamic interactions occur without affecting the stability, modularity and extensibility of the application. New improvement as well as addition of additional sensors, additional diagnostic modules as well as additional analytical modules can be undertaken without the need of having to redesign the structure.



VI. PROPOSED METHOD IMPLEMENTATION AND ALGORITHMS

Skin Safe AI(Derma Care) System implementation follows a layered analytical approach for accurate skin condition diagnosis and safe user experience. The following algorithms are incorporated within the system:

A. Skin condition classification algorithm based on visual features (VFSC-Algo):

This operates as the principal diagnostic module of the system. It employs a feature-driven pattern analysis technique to decipher visual features, as extracted from captured skin images. Diagnostic markers such as textural, color, and morphological skin features are correlated with a database of skin conditions in a structured manner, and the algorithm assigns a skin condition and the Confidence Score (CS) of this classification, based on the similarity of the markers with the database.

B. Environmental Risk calculation on Diagnostic output (WERC-Algo):

A weighted environmental risk calculation, This module processes the diagnostic output together with real-time user environment parameters, to calculate the risk factor for the skin condition. The algorithm dynamically computes a Safety Index by correlating the detected skin condition with environmental parameters such as local UV-factor, retrieved through an environmental API layer.

Equation:

$$SI = (Severity \times 0.6) + (UV\_Index \times 0.4)$$

This enables safety warnings and preventive advice to be generated by the system.

C. DRPM-Algo: Pathway Mapping Algorithm for Dynamic Recovery

We propose a state-based algorithm for dynamic user guidance and preventive recommendations. This algorithm establishes a tailored recovery and precautionary pathway determined by the results of classification, severity signals, and environmental context. The algorithm dynamically updates the recommendations for user care including exposure restrictions and skin care to ensure continued relevancy with ever-changing user input and atmospheric variations.

D. SSFM: Synthesized Speech Feedback Module

A module implemented using expo-speech library that gives a synthesized audio output of the diagnostic summary, safety warnings, and prospective preventive care. This functionality would enhance accessibility and provide a complementary, instantaneous response to the user, especially in hazardous environmental situations.

VII. RESULTS ANALYSIS

The system produces an organized, easy-to-understand report with the following components:

- Condition Identification: The predicted skin condition is displayed to users, followed by the percent confidence, e.g. “Acne - 86% Confidence”.
- Severity Rating: The detected condition is rated based on predefined thresholds, e.g. Low, Moderate, High, utilizing simple visualizations.
- Environmental Impact: Real-time environmental parameters, such as UV Index, are displayed to the users alongside contextualized safety recommendations, e.g. “UV Index 8: High Risk. Limit sun exposure”.
- Preventive Recommendations: Adaptive recommendations are provided, e.g. “Apply sunscreen”, “Keep Hydrated”, “Avoid sunlight” etc.

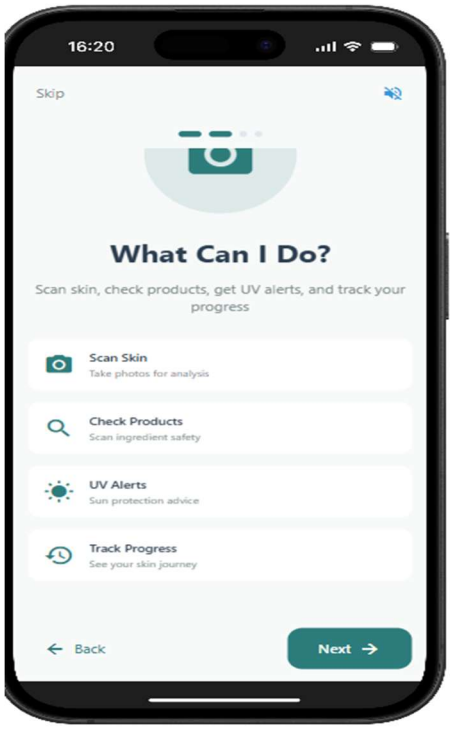


Fig 1: Feature Overview Screen

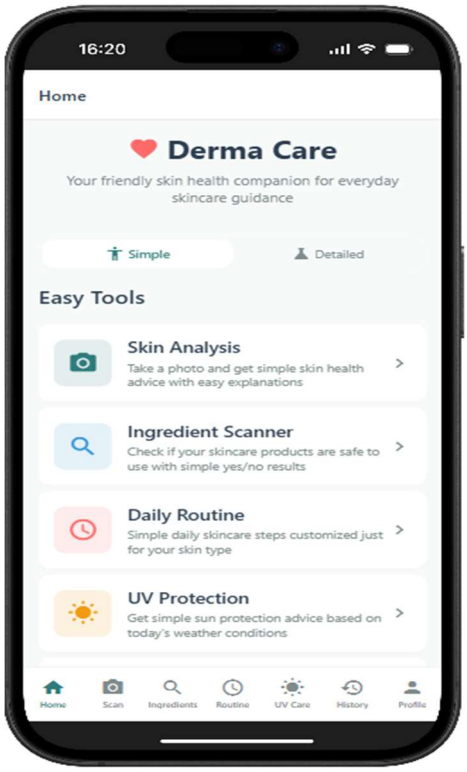


Fig 2: Home Dashboard Screen

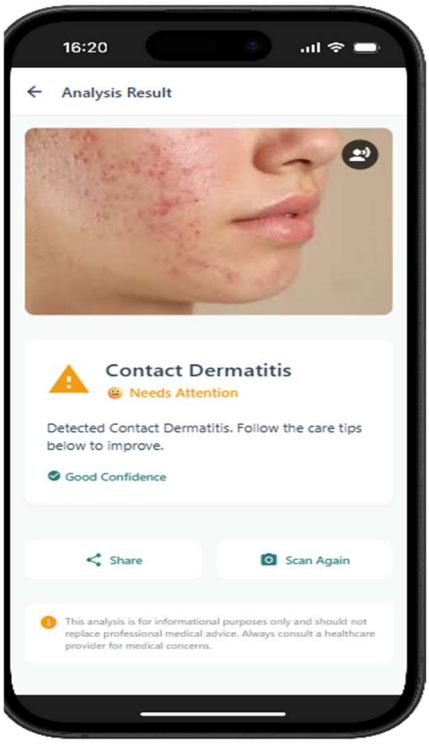


Fig 3: Skin Analysis Result Screen

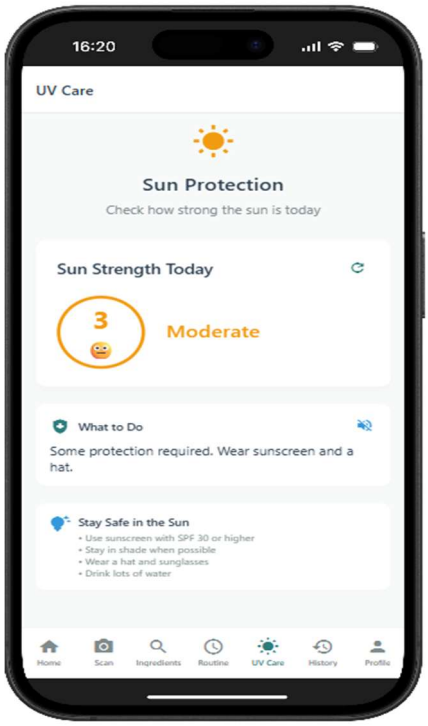


Fig 4: UV Care / Sun Protection Screen

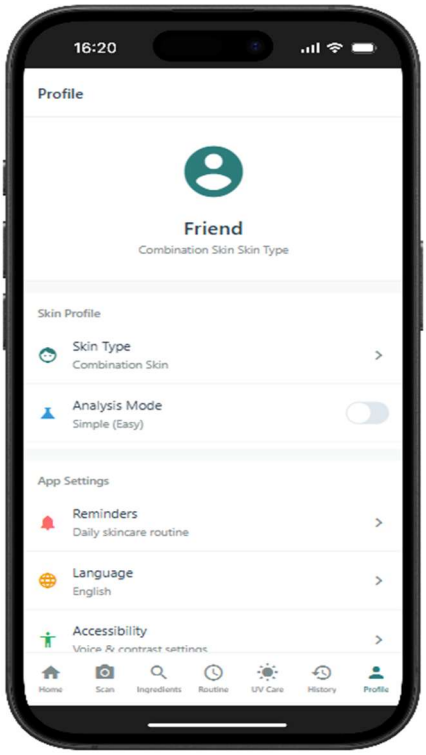


Fig 5: User Profile & Settings Screen

VIII. CONCLUSION

The current paper introduced the Skin Safe AI (Derma Care), an artificial intelligence-based mobile app that helps users to analyze their skin and prevent UV damage. The system has combined image based classification logic, environmental monitoring and adaptive recommendation mechanisms into a single and accessible system. However, the integration of both visual cues and actual environmental parameters makes the application proactive in health management and preventive awareness. A structured system design, maintainability, and scalability are guaranteed by the application of a modular MVC-based architecture. Mobile technologies are lightweight and allow the free flow of communication and effective functioning, which makes the application appropriate in practical use. The findings of system evaluation suggest that the offered solution will improve the awareness of users about skin-related issues and environmental risk factors. Although the present implementation successfully proves that the approach is feasible and useful, future research can be aimed at better classification accuracy, adoption of advanced deep learning models, the opportunities to analyze data offline, and dermatological dataset expansion. These enhancements can also increase the system reliability, flexibility and practicality.

REFERENCES

[1] Y. Yuan et al., "MUCM-Net: Lightweight Multi-Contextual Modeling Network for Skin Lesion Segmentation on Resource-Constrained Devices," *IEEE Access / Journal of Medical Imaging*, 2024.

[2] M. Himel et al., "Vision Transformer-Based Segmentation and Classification for Skin Lesion Analysis," *Proceedings of the International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2024.

[3] Authors, "Boundary-Aware Skin Lesion Segmentation with Cross-Consistency Training Mechanism (CCTM)," *Journal of Biomedical Imaging / Conference Publication*, 2025.

[4] Q. Liu, "FUSCA-Net: Enhancing Skin Disease Classification Through Feature Fusion and Spatial-Channel Attention Mechanisms," *IEEE Transactions on Medical Imaging / Pattern Recognition Journal*, 2025.

[5] A. Esteva et al., "Dermatologist-level classification of skin cancer with deep neural networks," *Nature*, vol. 542, no. 7639, pp. 115–118, 2017.

[6] Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning," *Nature*, vol. 521, no. 7553, pp. 436–444, 2015.