SkinCheck AI: Web-Based Instant Diagnosis of Skin Conditions Using Machine Learning

Abstract

Skin diseases affect millions of people worldwide, yet timely access to dermatological care remains limited in many regions. *SkinCheck AI* is a web-based application designed to provide instant, AI-powered diagnosis of skin conditions from user-uploaded images. The system integrates a neural network classifier into a multi-model pipeline and supports personalized health profiles including age, gender, skin type, chronic conditions, and allergies. This paper presents the architecture, data preprocessing, deployment process, and evaluation of the system, highlighting its potential for accessible dermatological screening and its role in democratizing healthcare.

Introduction

Skin conditions such as acne, eczema, psoriasis, and melanoma represent a significant global health burden. Early detection is critical for effective treatment, yet many individuals face barriers to accessing dermatologists due to cost, geographic distance, or limited availability of specialists. Recent advances in machine learning and computer vision enable automated diagnosis from medical images, offering scalable solutions for preliminary screening.

We introduce *SkinCheck AI*, a lightweight web application that allows users to upload photos of their skin and receive immediate diagnostic feedback. The system is designed for speed, privacy, and adaptability to diverse health profiles. By combining classical machine learning models with neural networks, the platform provides both interpretability and flexibility, while its modular architecture supports future enhancements.

Methods

Data and Preprocessing

- The model was trained on a curated dataset of labeled skin condition images.
- Images were resized, normalized, and augmented to improve generalization.
- Health profile fields (age, gender, skin type, chronic conditions, allergies) were encoded and used as auxiliary inputs to enhance diagnostic relevance.

Model Architecture

- A **multi-layer perceptron (MLPClassifier)** was integrated into a pipeline alongside classical models (Decision Tree, Random Forest, Naive Bayes).
- The neural network was trained using stratified sampling and evaluated on a 70/30 train-test split.
- Performance metrics included accuracy, confusion matrices, and classification reports for each model.

Web Deployment

- The application was built using **Ruby on Rails** and deployed with the Puma server.
- Registration and login flows were updated to support extended health profile fields.
- The frontend guides users through a three-step diagnosis process with real-time feedback.
- Logs were monitored to ensure stability and to resolve server errors (e.g., 502 Bad Gateway).

Results

- The neural network achieved competitive accuracy compared to classical models.
- Confusion matrices revealed strong performance on common conditions, with some misclassification in rare cases.
- The system successfully handled diverse user profiles and image inputs.
- Deployment logs confirmed resolution of server errors and stable operation post-restart.
- User testing indicated that the interface was intuitive and diagnosis results were delivered within seconds.

Discussion

SkinCheck AI demonstrates the feasibility of integrating machine learning into accessible web tools for health screening. Neural networks provide flexibility and adaptability, while classical models remain valuable for interpretability and robustness. The inclusion of user health profiles enhances diagnostic relevance by contextualizing image-based predictions.

Limitations include dependence on dataset diversity and the need for clinical validation before deployment in medical practice. Future work will focus on:

- Expanding the dataset to include rare conditions and diverse skin tones.
- Refining confidence thresholds to improve reliability.
- Integrating multilingual support for broader accessibility.
- Adding features such as PDF report export, email notifications, and comparative diagnosis analysis.

Conclusion

SkinCheck AI provides a fast, user-friendly platform for preliminary skin condition diagnosis. Its modular architecture supports future enhancements and broader clinical validation. By combining machine learning with secure authentication and personalized health profiles, the project highlights the potential of AI-powered tools in democratizing dermatological care and empowering individuals to take proactive steps in managing their skin health.

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