IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

CNN-BASED SKIN DISEASE SYSTEM: A REVIEW

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***Abstract*—** Skin disease prediction and identification have long been difficult and crucial tasks for medical practitioners. Numerous clinics and skin care specialists charge outrageous prices for their services. The prevalence of skin conditions is widespread throughout our nation simultaneously. The majority of skincare professionals currently use time-consuming traditional methods to detect diseases, which may take a long period. Skin diseases have become important issues in recent years due to various environmental, socioeconomic, and dietary variables. This essay compares various skin illnesses regarding both cosmetics and common skin problems. A review of several publications is conducted based on the technologies employed, the accuracy of the results, the ethical behavior, the number of diseases identified, the datasets, etc.

Keywords- Artificial Intelligence, Deep Learning, Skin, Cosmetic, Diseases; Survey, Cosmetology, Intelligent System

I. INTRODUCTION

The most important health issue on the planet is skin disease. One of the challenging areas to predict is human skin. There are numerous kinds of skin conditions. Some are chronic conditions, while others are allergic. Correctly identifying and treating a skin issue is a time-consuming process. Different diseases have various symptoms. The fields of cosmetology focus on the skin, hair, and nails.

Every person on the planet worries about how they look and feel at some point. The symptoms and severity of skin disorders can vary greatly. They might be either permanent or transitory, unpleasant or not.

If artificial intelligence (AI) can diagnose skin diseases from user-captured skin images using a mobile camera, it offers the potential for users to easily submit their skin images, thus enhancing their chances of having the skin condition examined before symptoms manifest. This also gives us an idea to whether we need to visit the dermatologist or not as they might be more expensive.

The challenges, within the system would involve dealing with the range of skin conditions that can manifest in ways that make it difficult to classify them. Ensuring the quality of data is also crucial as it needs to be diverse and correctly labelled. Ethical and legal considerations come into play too especially when handling information and ensuring privacy and consent.

On the other hand, there are benefits to using AI in this context. One advantage is that it enables precise diagnoses assisting dermatologists and users in detection more effectively. Additionally, it improves access to healthcare in underserved areas. By optimizing the utilization of dermatologist's time there's also a reduction in healthcare costs.

To summarize a project focused on skin diseases that utilize CNN-based learning and computer vision aims to automate the diagnosis and classification of skin conditions. This automation has potential, for enhancing efficiency and accuracy within care.

II. Related Work

The present study strongly suggests a possible relationship between F1F0-ATP synthase, ATP, and keratinocyte differentiation. It also provides new insights into the mechanism by which energy metabolism possibly regulates. Skin disease may elicit psychosocial comorbidities, and psychosocial stresses may elicit skin disease; a perfect spiral of cause and effect.

Skin cancer, the most common human malignancy1–3, is primarily diagnosed visually, beginning with an initial clinical screening and followed potentially by dermoscopic analysis, a biopsy and histopathological examination.

In this paper, we applied deep neural network algorithm to classify dermoscopic images of four common skin diseases and archived promising results. Based on the results, we further summarized the diagnosis/ classification scenarios, which reflect the importance of combining the efforts of both human expertise and computer algorithms in dermatologic diagnoses.

We present a facial image analysis framework, Deep Gestalt, using computer vision and deep-learning algorithms, that quantifies similarities to hundreds of syndromes. Deep Gestalt outperformed clinicians in three initial experiments, two to distinguish subjects with a target syndrome from other syndromes, and one of separating different genetic subtypes in Noonan syndrome. The first case represents the identification of the most common cancers, the second represents the identification of the deadliest skin cancer. The CNN achieves performance on par with all tested experts across both tasks, demonstrating an artificial intelligence capable of classifying skin cancer with a level of competence comparable to dermatologists.

In this paper, the authors applied a deep neural network algorithm to classify dermoscopic images of four common skin diseases and achieved promising results. Based on the results, we further summarized the diagnosis/ classification scenarios, which reflect the importance of combining the efforts of both human expertise and computer algorithms in dermatologic diagnoses.

Three skin conditions, fungal skin diseases, other skin and subcutaneous diseases, and acne were in the top 10 most prevalent diseases worldwide in 2010, and eight fell into the top 50; these additional three skin problems were acne[a], herpes zoster[b], and tinea[c]. The images of some of the skin diseases have been displayed.

(a) Acne

(b) Herpes Zoster

(c) Tinea

III. Problem Statement

Develop a CNN-based skin disease classification system capable of accurately identifying various skin conditions from images, to aid dermatologists and healthcare professionals in timely diagnosis and treatment.

IV. Objective

1. High Accuracy Classification: Develop a CNN model that achieves a high level of accuracy in classifying different skin diseases, ensuring reliable diagnoses.

2. Multi-Class Detection: Enable the system to recognize and categorize a diverse range of skin conditions, including common and rare diseases.

3. Real-Time Diagnosis: Implement real-time image analysis to provide quick and efficient diagnoses, reducing waiting times for patients.

4. User-Friendly Interface: Create an intuitive and user-friendly interface for dermatologists and healthcare professionals to upload images and receive accurate disease predictions.

5. Data Privacy and Security: Prioritize the security and privacy of patient data by implementing robust data encryption and access controls to comply with healthcare regulations.

V. Algorithms Used

Creating a Convolutional Neural Network (CNN) for skin classification involves a multi-step process. First, assemble a labelled skin image dataset and preprocess the images. Then, design a CNN architecture with convolutional and pooling layers for feature extraction. Train the model using a suitable loss function and optimization algorithm, monitoring performance on a validation set and avoiding overfitting. Evaluate the model on a test dataset, employing various metrics for accuracy and interpretability. Fine-tune the model, optimize hyperparameters, and consider techniques like transfer learning. Deploy the system in a production environment and maintain continuous improvement by updating the model with new data. It's crucial to adhere to ethical and privacy regulations when handling medical data and to consult with medical professionals for guidance and permissions.

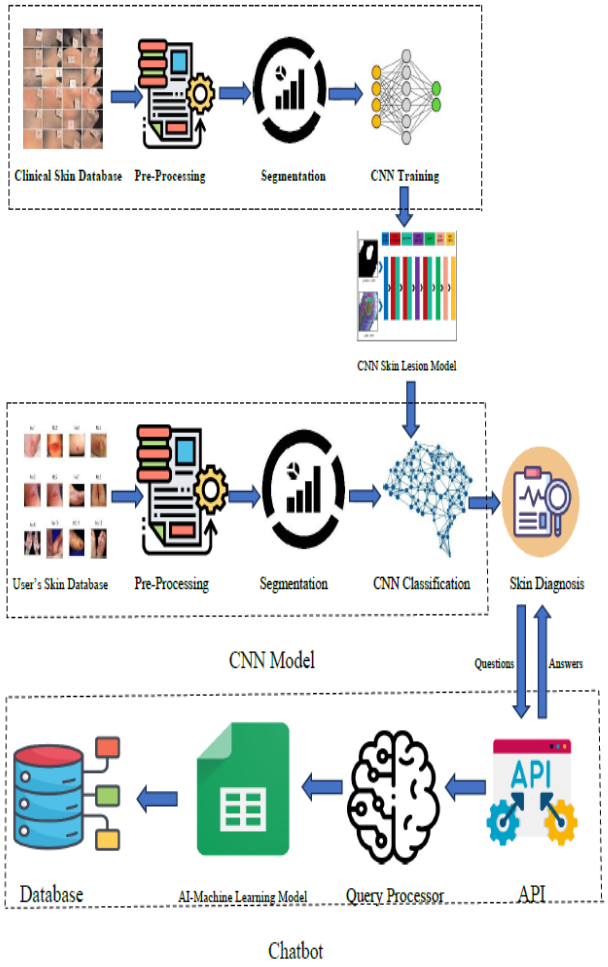
In addition to the CNN-based skin classification system, consider incorporating a basic chatbot based on NLP would be designed that can provide users with answers to questions related to skin diseases. The chatbot would be trained on a database of medical literature and dermatological information to offer relevant responses to user queries. Users can interact with the chatbot to seek general information about skin conditions, symptoms, and initial recommendations for self-care. This chatbot can serve as a valuable resource, providing immediate assistance and education to users, complementing CNN's diagnostic capabilities.

Image sharpening is a digital image processing technique aimed at enhancing image details and improving clarity. One common algorithm for image sharpening is the Laplacian sharpening filter, which involves applying a Laplacian kernel to the image. This filter highlights rapid intensity changes, effectively accentuating edges and fine details in the image. By subtracting the filtered image from the original, the result is a sharpened image with enhanced contrast and edge definition.

In summary, developing a CNN-based skin classification system is a structured process involving data collection, preprocessing, model architecture design, training, evaluation, optimization, deployment, and ongoing improvement. With that a chatbot using NLP would be designed to interact with the users and give them answers to the queries they would be having. Ethical considerations and collaboration with medical experts are integral to its success.

VI. Proposed Architecture

Proposed Architecture



VII. Results

Below are the results of our CNN-based model existing and proposed-

TABLE I. Performance Comparison

	Existing System	Proposed System
Precision	85.45%	92.70%
Recall	79.65%	68.64%
F-measure	72.11%	74.31%
Accuracy	80.29%	87.26%

VIII. Conclusion and Future Scope

Future Scope:

The integration of CNN-based frameworks in dermatology holds colossal potential for long term. A few roads for future inquire about and advancement include:

1. Improved Precision: Proceeded refinement of CNN designs and preparing techniques can advance make strides the precision of skin illness determination and prediction.

2. Extension of Datasets: Consolidating bigger and more different datasets can progress the generalization capability of CNN models, empowering them to precisely recognize a broader extend of skin conditions over distinctive statistic groups.

3. Real-time Conclusion: Creating CNN-based frameworks able of real-time determination can altogether diminish the time between persistent examination and treatment start, driving to progressed persistent outcomes.

4. Telemedicine Integration: Joining CNN-based dermatology frameworks with telemedicine stages can encourage inaccessible determination and meeting, especially in underserved ranges with constrained get to to dermatological expertise.

5. Interpretability: Improving the interpretability of CNN models can offer assistance to clinicians way better get it the basis behind symptomatic choices, cultivating belief and acknowledgment of AI-driven demonstrative tools.

6. Moral Contemplations: Proceeded consideration of moral contemplations, such as persistent security, information security, and algorithmic predisposition, is vital to guaranteeing the mindful sending of CNN-based dermatology systems.

Conclusion:

In conclusion, CNN-based skin infection frameworks speak to a promising approach to progressing the precision and productivity of dermatological determination and expectation. By leveraging profound learning strategies, these frameworks can analyze skin pictures with a level of exactness and speed that conventional strategies cannot coordinate. In any case, encourages inquire about what is required to optimize CNN structures, grow datasets, and address moral considerations.

The integration of CNN-based frameworks into clinical hone has the potential to revolutionize dermatology, empowering prior location of skin illnesses, personalized treatment recommendations, and moved forward understanding results. With continuous headways in AI and profound learning, the long run of dermatology holds energizing conceivable outcomes for the improvement of inventive symptomatic devices and innovations.

Acknowledgment

We would like to extend our gratitude to Kaggle for their invaluable contributions. Kaggle's provided datasets were instrumental in achieving our research goals. We deeply appreciate their commitment to innovation and collaborative efforts, which were pivotal to our successful research of the project.

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