Teledermatologist: Automated Diagnosis of Skin Diseases with Image Recognition

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***Abstract*—Early diagnosis of skin diseases is crucial for effective treatment, preventing spread, minimizing long-term damage, managing chronic conditions, detecting underlying health issues, and promoting psychological well-being. It is often necessary to do difficult tests in order to obtain a diagnosis, which demands a lot of resources from patients as well as medical personnel. Motivated by this shortage, we introduce a user-friendly and private system for the automatic detection of skin disease from a picture. Our system employs a deep neural model for the accurate classification of a given picture to one of the predefined classes of diseases. We created a large dataset of six skin lesion types and tested different neural models. The best-performing model, which achieved 92% accuracy, was integrated into our system. The application and its web demo can be accessed at https://teledermatologis-ai.streamlit.app/.**

***Index Terms*—Facial Skin Disease, Image Recognition, Dataset**

Skin diseases can have a significant impact on a person's psychological well-being [1] and lead to social anxiety, low self-esteem, and depression. In some cases, healthcare providers may use pictures or images of skin lesions for early diagnostic purposes (teledermatology) that involves capturing clear and detailed photographs of the affected skin and transmitting them to a dermatologist for diagnosis. Teledermatology is useful when access to doctors is limited or when a preliminary assessment is needed before an in-person consultation.

Inspired by this fact, we developed a software application to assist people with facial skin problems who have limited access to dermatologists. The application classifies a picture, submitted by the user, into seven basic categories: *Acne*, *Carcinoma*, *Eczema*, *Keratosis*, *Milia*, *Rosacea*, and *None*, and displays the assigned category with classification confidence, as illustrated in Figure 1(top). Pictures containing unrelated content are expected to be assigned to the "None" class. We implemented a standard pipeline for supervised learning of deep neural models. For training these models, we collected our own dataset[1] of 1,657 pictures classified into seven categories, mentioned above. The ground truth labels were taken from ISIC (https://challenge.isic-archive.com/data/#2018), HAM10000 (https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/DBW86T), DermNet (https://dermnetnz.org/), sd-198 (https://paperswithcode.com/dataset/sd-198), and Kaggle - Unsplash random images collection (https://www.kaggle.com/datasets/lprdosmil/unsplash-random-images-collection) datasets. The following models were evaluated on our dataset: Sequential, InceptionV3, Xception, EfficientNetV2, and ConvNeXtBase (https://keras.io/api/applications/). Xception provided the best (92%) accuracy, therefore it was finally integrated into our system.

[1]Available at (https://www.kaggle.com/datasets/blindreviewing/dataset).

I. System Overview

The system is a standalone application that needs to be installed locally on a user's computer. The installation files include the pre-trained Xception model. Once an image is uploaded via the 'Browse' button, it enters the pre-processing phase, meticulously preparing the image for model consumption and ensuring optimal input conditions for accurate prediction. Upon pressing the 'Predict' button, the image is transferred to the model for classification. The resulting prediction, along with the corresponding confidence, is then displayed to the user. To facilitate further user research, appropriate web links related to the identified lesion type are also provided. Our system incorporates accessibility design principles. The application offers adjustable themes ('Light' and 'Dark') and scale options ranging from 80% to 120%, enhancing usability for visually impaired users. The advantage of the standalone architecture is that it does not save uploaded pictures in any external databases, so the privacy of its users is preserved. The web demo of our application is built with Streamlit (https://streamlit.io/) and is accessible from everywhere. It is adjustable for mobile use and works over HTTPS protocol.

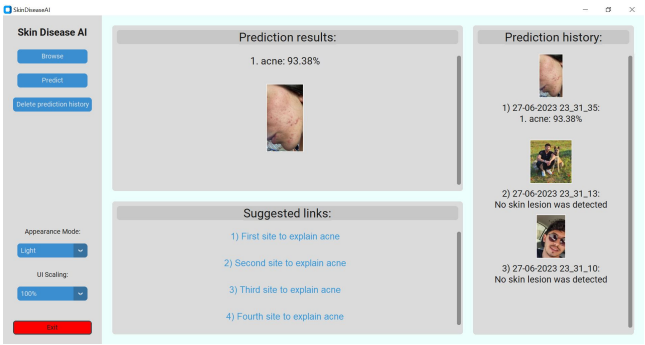

Fig. 1. A snapshot from the application prediction.

References

[1] B. Barankin, J. DeKoven. "Psychosocial effect of common skin diseases." Canadian Family Physician, 48(4), pp.712-716, (2002).