SKIN DISEASE DETECTION AND CLASSIFICATION USING DEEP LEARNING ALGORITHMS

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ABSTRACT

Human health is more important than other diseases. Skin infections are usually caused by fungal infections, bacteria, allergies or viruses. Medical equipment for such diagnoses is limited and expensive. Therefore, deep learning techniques help detect skin diseases in their early stages. Feature extraction plays an important role in classifying skin lesions. Using deep learning reduces the need for human labor such as manual extraction and data reconstruction for classification purposes.

INTRODUCTION

Background Study

Skin malignant growth is one of the most predominant types of disease, with its frequency consistently expanding around the world. Early location and exact analysis are basic variables for fruitful treatment results and further developed patient endurance rates. Nonetheless, manual assessment of skin sores by dermatologists is emotional and can be tedious, prompting possible blunders and defers in analysis.

Purpose

The purpose of a skin cancer detection project is to develop and implement a system or method that can accurately identify and detect skin cancer in its early stages. Skin cancer is one of the most common types of cancer, and early detection plays a crucial role in improving patient outcomes andsurvival rates.

The project aims to leverage technology, such as artificial intelligence (AI) and machine learning algorithms, to analyze images or other data related to skin lesions and identify potential signs of skincancer. This technology can assist healthcare professionals in making more accurate diagnoses, reducing the need for invasive biopsies, and enabling early intervention and treatment.

By developing an effective skin cancer detection system, the project aims to achieve several goals:

1. **Early Detection:** Detecting skin cancer at an early stage can significantly increase the chances ofsuccessful treatment and recovery. The project aims to create a tool that can identify suspicious skin lesions accurately and prompt patients to seek medical attention promptly.

2. **Accuracy:** The system should strive to provide accurate diagnoses by analyzing various features of skin lesions, such as shape, color, texture, and size. This can help minimize the chances of misdiagnosis and unnecessary invasive procedures.

3. **Accessibility:** The project may also focus on creating a user-friendly and accessible platform, allowing individuals to perform self-assessments or seek preliminary evaluations from healthcare professionals remotely. This can be particularly beneficial for areas with limited access to dermatologists or specialized healthcare facilities.

4. **Support for Healthcare Professionals:** The project can provide additional support to healthcare professionals by acting as a diagnostic aid. It can help doctors in making informed decisions and assist them in identifying potentially malignant skin lesions that might be challenging to detect with the naked eye.

RELATED WORK

This study has completed the study of skin diseases such as eczema, psoriasis, acne vulgaris, pruritus, alopecia Areata, decubitus, urticaria, scabies, fungal infections, impetigo, abscesses and others. Skin diseases Cellulitis, warts, molluscum contagiosum, and nonmelanoma tumors. Assessing the burden of nonfatal death through disability estimation. More importantly, three skin diseases (fungal infections of the skin, other skin and subcutaneous diseases, and acne) were among the 10 most popular diseases worldwide in 2010, with 8 of them in the top 50. Other skin problems include hives, eczema, impetigo, scabies, and molluscum contagiosum. Collectively, these dermatological diseases rank between the 2nd and 11th leading causes of disability in the country and the fourth leading cause of nonfatal disease worldwide. These findings highlight the high burden of dermatosis in both high- and low income countries and the urgent need to integrate prevention and treatment of the disease into future global health strategies[1].

An epidemiological study was conducted at the university. 8,226 students who underwent health screenings and filled out surveys about drinking took part in the study. A dermatologist examines the skin during a health assessment. Logistic and generalized additive models were used to evaluate associations, using adjusted odds ratio (aOR) as the measure. Analysis of 8197 student responses showed that regular carbonated soda consumption , sweetened tea sugar and fruit consumption adjusted for confounding variables. Finally, drinking water was associated with severe acne. Drinking soda occasionally (2 times per week) was slightly protective against acne. The association between soft drink consumption and acne was nonlinear ($P < .01$), with consumption of ≤100 g/day being associated with moderate to severe acne. In summary, drinking water every day increases the risk of weight gain from acne, especially in young people who consume more than 100 grams of sugar per day from all types of sweet drinks[2].

Rosacea is a type of facial disease that affects the patient's quality of life. The RosaceaSpecific Quality of Life Tool (RosQol) is a broad questionnaire specifically designed to assess rosacearelated quality of life, but its validity in Chinese patients remains unresolved. This study aims to validate the Chinese version of RosQol. At first, the survey was translated into Chinese. Rosacea patients then completed RosQol and the Dermatology Quality of Life Index to assess their quality of life. Demographic and clinical data, including self-report scores and rosacea severity scores, were also collected. Internal consistency was assessed using Cronbach's alpha, test-retest reliability, and Spearman correlation. Methods for validity and internal consistency were also evaluated. Although most items of the RosQol have been shown to be consistently valid, items 13 and 19 have no relevance to the Chinese population and are therefore not included. The final revised Chinese version of RosQol was found to be reliable and valid. Importantly, changes in patients' symptoms coincided with changes in RosQol-related dimensions[3].

To further investigate the immunological effects of leptin, we created a transgenic pig expressing leptin under the control of the porcine leptin (pleptin) promoter, thereby inducing overexpression of leptin. Transplanted pigs exhibited symptoms of systemic lupus erythematosus (SLE), such as anemia, leukopenia, thrombocytopenia, and impaired kidney and liver function. Histological examination revealed increased immunoglobulin G (IgG) levels, increased antiplatelet antibody (APA) levels, and the presence of antibodies in the kidneys and liver.

Additionally, serum antibody tests showed an increase in anti-double stranded DNA antibodies (dsDNA), antinuclear antibodies (ANA), and anti nucleosome antibodies (ANuAs) .These observations were accompanied by a decrease in regulatory T cells (Tregs). Importantly, experimental glucocorticoid treatment partially ameliorated the autoimmune response and bleeding symptoms seen in genetically modified leptin pigs. These findings highlight the important role of leptin in the development of autoimmune diseases and highlight the potential of genetic modification of leptin as an important model to study SLE[4].

ATP synthase is an enzyme complex that is usually found in the mitochondrial membrane and sometimes inhibits cell proliferation by participating in the formation or hydrolysis of ATP in the cell membrane. This study aims to reveal the role of F1FATP synthase in keratinocyte differentiation and its relationship with intracellular and extracellular ATP (InATP and ExATP). Expression of the F1F0ATP synthase beta subunit (ATP5B) was evaluated in various tissues and in confluencedependent HaCaT differentiation model. ATP5B expression increases during keratinocyte and HaCaT cell differentiation, as seen in normal skin, some epidermal hyperproliferative diseases, squamous cell carcinoma, and HaCaT cell differentiation models. The effect of InATP and ExATP levels on HaCaT differentiation was evaluated by analyzing the expression of different intrapulins. Inhibition of F1F0ATP synthase affects HaCaT cell differentiation and is associated with a decrease in InATP content, while ExATP levels remain unchanged. These findings suggest a link between F1ATP synthase expression and keratinocyte differentiation, possibly mediated by InATP synthesis[5].

Motivation

- **Improved User Experience**: Virtual trial rooms give a vivid and intelligent experience to users, permitting them to try on various things and imagine how they would look on themselves in avirtual environment.

This can extraordinarily improve the user experience by making online shoppingseriously captivating, convenient, and personalized, prompting expanded consumer loyalty.

- **Expanded Deals and Decreased Returns**: Virtual trial rooms can assist organizations with helping their deals by permitting users to virtually try on things and pursue informed buy choices. \

- **Further developed Effectiveness and Manageability**: Virtual trial rooms can diminish the requirement for actual trial rooms in physical stores, saving space and operational expenses. Additionally, virtual trial rooms can contribute to supportability endeavors by diminishing the environmental effect related with the production, transportation, and removal of actual apparel tests utilized in traditional trial rooms.

- **Upper hand**: By offering a virtual trial room application, organizations can acquire a strategicadvantage in the market by giving an exceptional and creative shopping experience to their customers.This can help draw in and hold customers, separate from competitors, and lay out a strong brand picture as an early adopter of arising innovations.

Problem Statement

Automated detection of Skin disease using deep learning technique and provide Explain-ability techniques to help us better understands our model's predictions, and how we could further improve its performance.

OBJECTIVES

I. To demonstrate the use of machine learning model on color images for the recognition of Skin disease.
II. To assess the role of XAI based automated model for detection of Skin disease by color images.

SCOPE OF THE PROJECT

The extent of a skin disease recognition undertaking can differ contingent upon the particular objectives and assets accessible. In any case, here are a few familiar perspectives that might be remembered for the extent of such a task:

1. **Information Assortment:** Assembling a far reaching dataset of skin pictures or clinical records ofpatients with known skin disease analyze. This dataset will be utilized for preparing and assessing thelocation framework.

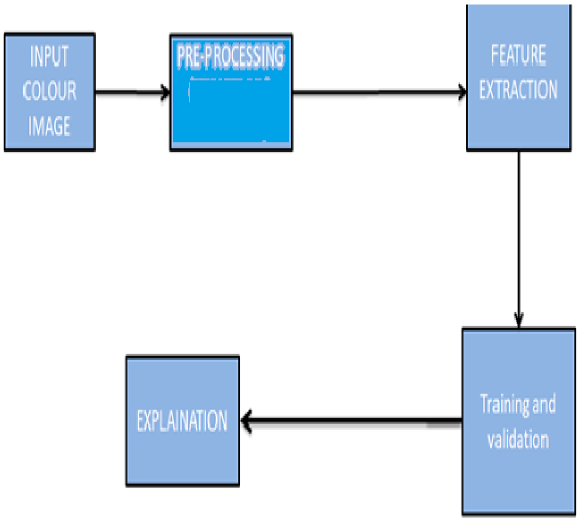
2. **Picture Handling and Examination**: Creating calculations and methods for handling and breakingdown skin pictures. This might include pre-handling steps like sound decrease, picture improvement, and division to seclude applicable region of the skin.

3. **Highlight Extraction**: Removing significant elements from the skin pictures that can be utilized to recognize typical and dangerous skin cells or injuries. These highlights might incorporate surface,variety, shape, or lopsidedness measures.

ARCHITECTURAL FRAMEWORK

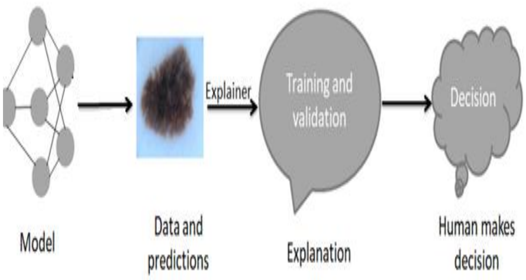
The architecture framework of the Skin disease detection system can be that of a segmentation, in which the colour images (data) go through the Resnet-50 a deep learning module represented as filters for SHAP model and Resnet -18 for Grad-cam model.

On classification, the performance of the model is to be tested and validated. If suitable results are not obtained, feature extraction is revisited to identify the significant features to give the result.



Structure of the model

The above figure explains that the Resnet-50 and Resnet-18 models will be given the input colour images for pre-processing the data where the image will be segmented and feature extraction will be done later on, the classification will be made which will be trained and tested and gives the result.



Architecture of the model

For image detecting, we are using a pre-trained model which is Resnet-50 and Resnet-18. SHAP and GRAD-CAM model will be used to explain the models prediction for better understanding of the Resnet-50 and Resnet-18 models we have used for training and testing the data set. SHAP and GRAD-CAM aims to attribute a model's prediction to human-understandable features. In order to do this, we need to run the explanation model on a diverse but representative set of instances to return a non-redundant explanation set that is a global representation of the model.

Convolutional Neural Network (CNN)

A Convolutional Neural Organization (CNN) is areas of strength for a learning model explicitly expected for assessing visual info, for example, photographs or films. CNNs have upset PC visionand have turned into the go-to decision for a great many applications, from picture grouping to protest acknowledgment and picture division.

The engineering of CNN is intended to look like the various leveled association of the human visual framework. It comprises of various layers, each playing out an unmistakable job. The fundamental layers of CNN are the convolutional layers. In these layers, channels or parts are applied to the information. The channels execute component wise duplications and summations with little nearby parcels of the information, known as open fields. By eliminating local examples or elements from the info information, this technique empowers the organization to learn valuable portrayals. This strategy pulls neighborhood examples or highlights from the info information, permitting the organization to learn significant portrayals.

To integrate non-linearities and catch muddled connections, an actuation capability, like the Amended Straight Unit , is much of the time applied component wise to the result of the convolutional layers. This helps the organization learn and address more nuanced properties.

Pooling layers assume a basic part in CNN by down examining the result of the convolutional layers. Generally utilized pooling procedures incorporate max pooling, where the greatest worth in each pooling locale is chosen, and normal pooling, which takes the typical worth. By bringing down the spatial aspects while keeping basic properties, pooling layers improve the organization's protection from vacillations in the information, like interpretation or scaling.

The result of the pooling layers is then taken care of into completely connected layers. These layersassociate each neuron in one layer to each neuron in the following layer, permitting the organization to learn significant level portrayals and create forecasts in light of the learnt highlights. Enactment capabilities are added to the result of these completely connected layers too, presenting non-linearities and empowering the organization to reenact confounded communications between the qualities.

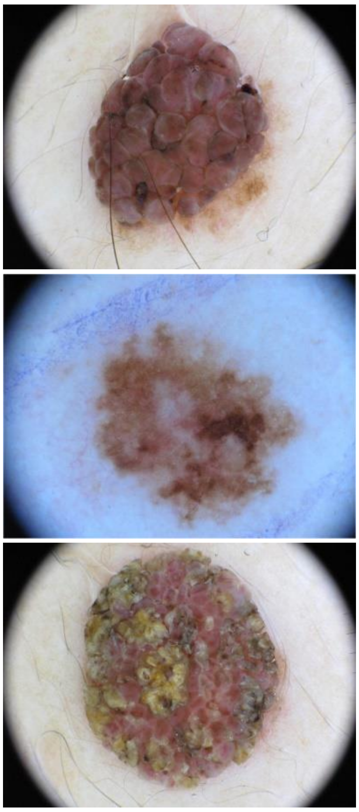
RESULTS AND DISCUSSIONS

In this chapter, the results of the implementation methodology and the Explainable AI model will be discussed.

DATASET DESCRIPTION

The data utilized from an open source Kaggle dataset we use a dataset created by Skin Cancer MNIST: HAM10000 picture Archive communication system for a challenge based on a problem on Kaggle. The dataset is labeled dataset with acne and some skin allergies images rated with expert opinion on images.

Some sample images from the dataset can be seen in figure 5.1. The entire dataset itself is divided into training and validation datasets.



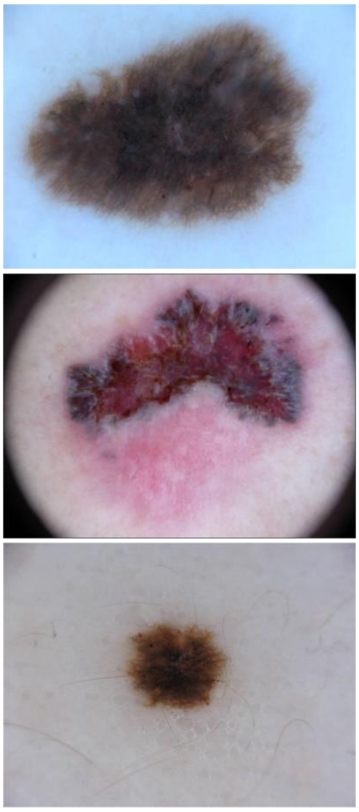
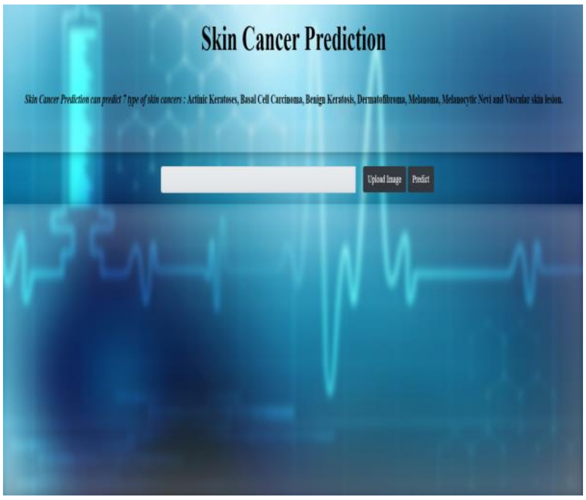
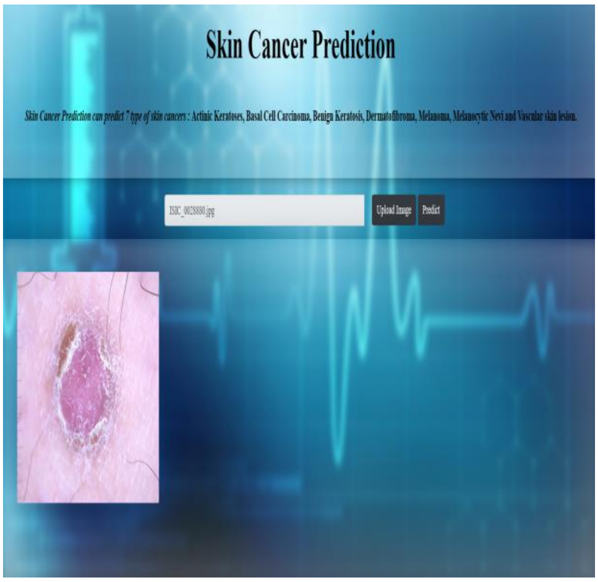
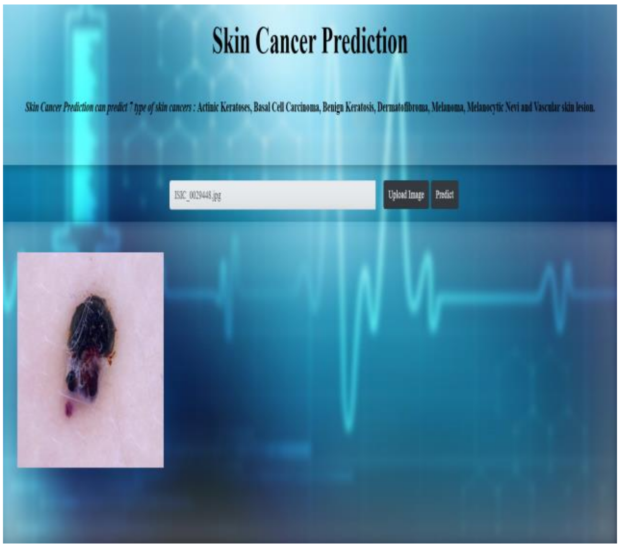
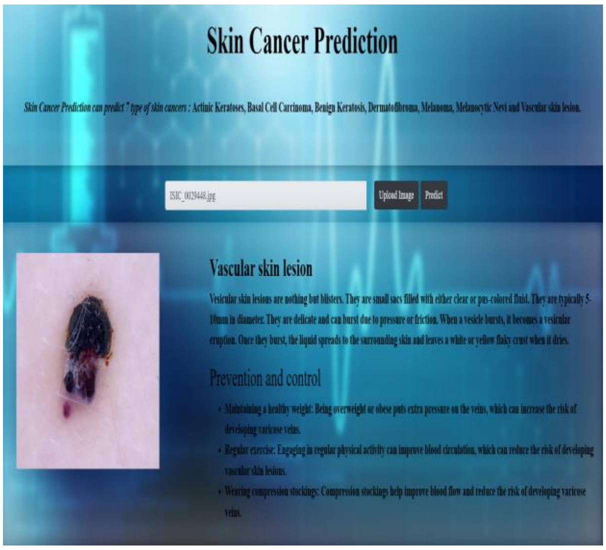


Fig 5.1: Sample images from the dataset









CONCLUSION

A skin cancer detection project involves developing a system that can accurately identify and classify skin cancer based on images or other relevant data. The project typically includes several key components, such as data preprocessing, feature extraction, machine learning models, evaluation metrics, and a user interface. The goal is to create a reliable and efficient system that aids in the early detection of skin cancer, improving patient outcomes.

The project begins with collecting and curating a diverse dataset of skin images, which servesas the foundation for training and testing the system. Data preprocessing techniques are applied to standardize the images, remove noise, and enhance relevant features. Feature extraction algorithms are then employed to extract informative characteristics from thepreprocessed data, capturing important patterns and textures indicative of skin cancer.

FUTURE SCOPE

Incorporating Artificial Intelligence (AI) and Deep Learning: Investigate progressed computer based intelligence procedures, for example, profound learning structures like convolutional brain organizations (CNNs), to work on the precision and execution of skin malignant growthidentification.

Multi-Modular Methodologies: Coordinate extra modalities and information sources, for example, dermatoscopic pictures, patient history, hereditary data, or other analytic tests, to work on the by and large demonstrative exactness.

Real-Time Image Analysis: Foster continuous picture investigation abilities to empower moment skin malignant growth discovery during dermatologist counsels or telemedicine arrangements.

REFERENCES

[1] R.J. Hay,N.E.Johns, H.C.Williams,I. W.Bolliger,R. P.Dellavalle, and D. J. Margolis, ''The global burden of skin disease in 2010: An analysis of the prevalence and impact of skin conditions,'' J. Investigative Dermatol- ogy, vol. 134, no. 6, pp. 1527–1534, 2014.

[2] X. Huang, J. Zhang, J. Li, S. Zhao, Y.Xiao, Y. Huang, D. Jing, L. Chen, X. Zhang, J. Su, Y. Kuang, W. Zhu, M. Chen, X. Chen, and M. Shen, ''Daily intake of soft drinks and moderate-tosevere acne vulgaris in Chinese Adolescents,'' J. Pediatrics, vol. 204, pp. 256– 262, Jan. 2018.

[3] Y. Deng, Q. Peng, S. Yang, D. Jian, B. Wang, Y. Huang, H. Xie, and J. Li, ''The rosaceaspecific quality-of-life instrument (RosQol): Revision and validation among Chinese patients,'' PLoS ONE, vol. 13, no. 2, Feb. 2018, Art. no. e0192487

[4] C. Junchen, W. Zeng, W. Pan, C. Peng, J. Zhang, J. Su, W. Long, H. Zhao, X. Zuo, X. Xie, J. Wu, L. Nie, H.-Y. Zhao, H.-J. Wei, and X. Chen, ''Symptoms of systemic lupus erythematosus are diagnosed in leptin transgenic pigs,'' PLoS Biol., vol. 16, no. 8, Aug. 2018, Art. no.e2005354.

[5] X. Xiaoyun, H. Chaofei, Z. Weiqi, C. Chen, L. Lixia, L. Queping, P.Cong, Z. Shuang, S. Juan, and C. Xiang, ''Possible involvement of F1F0-ATP synthase and intracellular ATP in Keratinocyte differentiation in normal skin and skin lesions,'' Sci. Rep., vol. 7, Feb. 2017, Art. no. 42672.

[6] Bewley, ''The neglected psychological aspects of skin disease,'' Brit. Med. J., vol. 358, p. 3208, Jul. 2017.

[7] .Almeida, M.A.M.; Santos, I.A.X. Classification Models for Skin Tumor Detection Using Texture Analysis in Medical Images.J.Imaging2020,6, 51. [CrossRef]

[8] .Ki, V.; Rotstein, C. Bacterial skin and soft tissue infections in adults: A review of their epidemiology, pathogenesis, diagnosis,treatment and site of care. The Canadian journal of infectious diseases & medical microbiology.Can. J. Infect. Dis. Med. Microbiol.2008,19, 173–184.

[9] .Cahan, A.; Cimino, J. A Learning Health Care System Using Computer-Aided Diagnosis.J. Med. Internet Res.2017,19,PMCID:PMC5362695. [CrossRef] [PubMed]