HUMAN SKIN CANCER DETECTION USING CNN

[1]Prof. Rajashekhar Ainapur, [2]Darshan B S, [3]Harshitha Y U, [4]Keerthana K S
[1]Professor, [2,3,4]Students
Department of CSE
East West Institute of Technology
Bengaluru, India

ABSTRACT

The skin, a vital part of the living human body, serves as a protective layer encompassing muscles and bones. Presently, a considerable number of individuals are grappling with skin cancer, particularly the perilous malignant melanoma. Given the widespread nature and potential severity of this condition, timely detection proves paramount for successful intervention. In this investigation, we advocate for an advanced and precise framework dedicated to identifying seven form of skin cancer by way of the utilization of Convolutional Neural Network (CNN). Our proposed CNN model undergoes training on a diverse dataset containing images portraying actinic keratosis, malignant melanoma, dermatofibroma, and seborrheic keratosis. The deep learning flow chat is intricately designed to autonomously discern hierarchical features from skin lesion images, thereby facilitating the recognition of nuanced patterns indicative of various cancer types. Our model attains a cutting-edge performance with regard to sensitivity, specificity, and overall accuracy. Furthermore, we leverage transfer learning methodologies to augment the model's adaptability across varied datasets. The envisaged CNN-based structure towards skin cancer recognition showcases promising outcomes, laying the groundwork for an effective and scalable tool for early diagnosis. This development holds the possible to significantly enhance patient outcomes and alleviate the global burden on skin cancer.

Keywords: Convolutional Neural Network, skin cancer, Image Processing, Machine Learning, ISIC, Dataset, Melanoma, skin lesion

1. INTRODUCTION

The skin constitutes the largest limbs in the human body, spanning about 20 square feet. Its primary functions contain regulating body temperature, shielding internal organs from ultraviolet rays and microbes, and facilitating sensations such as tangible concrete, warm, and cold. The occurrence of skin cancer antiquated rapidly rising in recent years. It denoted as common and potentially life-threatening condition characterized by the unconstrained proliferation of abnormal skin cells. Rapid detection is crucial for enhancing prognosis and treatment results, particularly given the diverse helpful of skin cancers. Utilizing advanced technologies like Convolutional Neural Network (CNN) and image rectifying techniques has demonstrated significant potential in automating the recognition and categorizing of skin injury related to different category of skin cancer. [1].

The Human beings skin comprises three layers: the epidermis, dermis, and hypodermis (as depicted in Figure 1). Within these layers, skin cancer injury can be broadly categorized into two types: benign and malignant. Skin cancer stands out significant lethal among various skin diseases affecting humans, particularly prevalent in individuals with fair skin. It is categorized into two important types: Malignant Melanoma and Non-Melanoma. Malignant Melanoma, characterized as a highly perilous form of cancer, is

predominantly observed in about 4% of the population. Strikingly, skin cancer remains a significant health concern, Malignant Melanoma is amenable for a staggering 75% of deaths attributed to skin cancer. This study mainly concentrated on the evolution of an motorized system towards the identification of seven various types of human skin cancer, including nevus, dermatofibroma, melanoma, pigmented Bow's, pigmented benign keratoses, basal cell carcinoma, and vascular lesions. Each of these types presen ts unique challenges as regards visual characteristics and diagnostic nuances, making their accurate identification a complex task for both clinicians and automated systems.

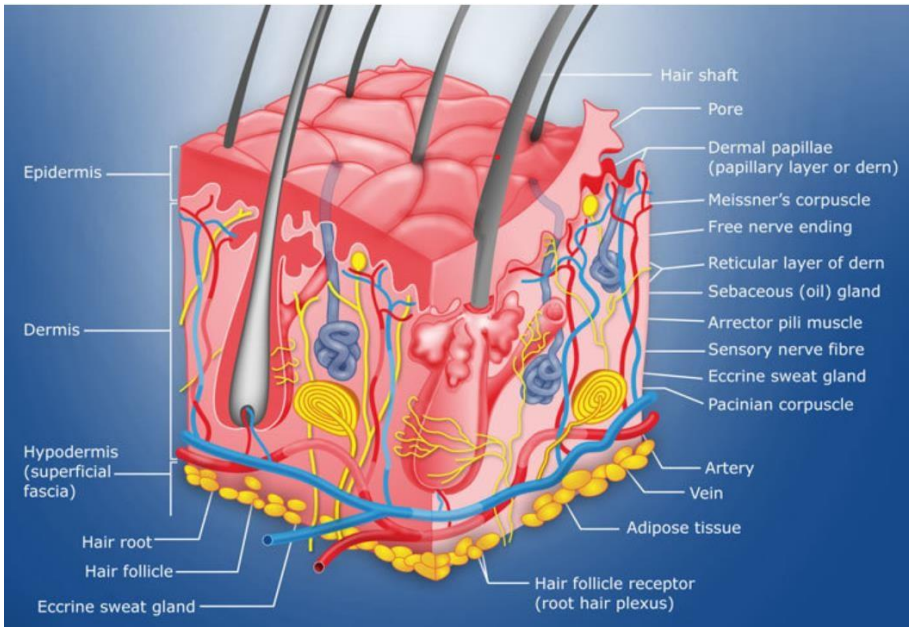

Fig. 1 - Skin anatomy

Therefore, the prior perception of skin cancer survives priority. Convolutional Neural Network continued demonstrated exceptional capabilities in image recognition tasks, making them particularly well-suited for the scanning of medical pictures, including dermatoscopic image of skin injury. By leveraging deep learning methods, CNNs can learn intricate patterns and features inherent in skin lesions, sanctioning them to discriminate between various based on skin cancer along a high degree of accuracy. In concurrence with CNNs, newly advanced image rectifying techniques are utilized to magnify the diagnostic capabilities of the system. These techniques involve the segmentation and extraction of relevant features from skin lesion images, providing a more detailed and comprehensive understanding of the characteristics associated with every kind of skin cancer. The integration of CNN algorithms and image rectifying methodologies in cancer perception holds highest potential for revolutionizing dermatological diagnostics. The design of fore study is to improve the existing body of research in the field by creating a robust and precise method for the automated identification of seven specific kind of skin disease. The ultimate goal is provide clinicians with a dependable tool that can aid in prior diagnosis, allowing for prompt medical interventions and improved patient outcomes. As we delve into the methodology and outcomes of fore analysis, we aim to demonstrate the effectiveness and potential clinical relevance of our recommend approach in advancing in the realm of spontaneous skin cancer recognition, they occur seven kinds of skin cancer illustrated in fig 2.

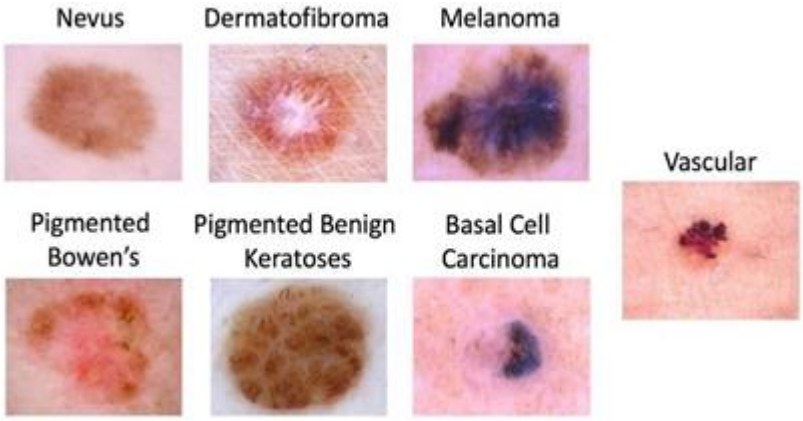

Fig. 2 – Types of skin cancer

2. LITERATURE REVIEW

Research conducted by different authors explores the perception of skin disease and various techniques for categorizing skin cancer diseases, as outlined below.

Krishna mridha et.al. [1] reported that deal to situation the challenge of severe class inequality in skin health datasets, a proposed Android application employs the Cutting-edge deep learning techniques are tried for the recognition of skin cancer. The study, using the HAM10000 dataset, features an influence CNN trained with Adam and RMSprop optimization functions and Relu, Swish, and Tanh activation functions. An explainable artificial intelligence (XAI)-based system, incorporating Grad-CAM and Grad-CAM++, enhances interpretability. The model reached an 82% sorted accuracy and 0.47% loss accuracy, providing valuable support for early skin cancer diagnosis.

Marwan ali albahar et.al. [2] presenting a novel skin lesion sorted model including a unique regularizer technique, our binary classifier achieves an impressive median accuracy of 97.49%. This surpasses state-of-the-art methods, emphasizing the model's effectiveness in precisely categorizing skin injury each to benign or malignant for enhanced diagnostic accuracy.

Maciej Ogorzałek et.al. [3] proposed a quickly proliferating global health concern, compounded by limited resources. Early detection is paramount for accurate diagnosis and preventive measures. Recognizing skin cancer at its inception poses a challenge for dermatologists. Recently, deep learning holds a key player in both supervised and unsupervised learning tasks, playing a critical part in the prematurely recognition of skin cancer.

R. Ashraf et al. [4] focused Numerous computer-aided solutions have been suggested to accurately identify melanoma cancer. Nevertheless, the challenging visual characteristics of nevi pose a significant hurdle in designing a dependable Computer-Aided Diagnosis (CAD) system for precise melanoma detection. Present systems either rely on traditional machine learning models, emphasizing handpicked features, or employ deep learning-based methods that leverage entire images for feature learning. The automatic extraction of the nearly all discriminative attribute of skin cancer remains a critical research challenge, offering potential improvements by deep learning training.

Mohamed A. Kassem et al.[5] proposed Skin cancer, particularly melanoma, is one of the most life-threatening diseases. Color sculpture towards the skin exhibit a high resemblance between various skin injury, like melanoma and nevus, posing challenges

for detection and diagnosis. An effective motorized system for classifying skin injury is critical for early detection, saving time, effort, and human lives. This paper introduces an motorized method for skin injury classification. The approach involves utilizing a pre-trained deep learning network and employing transfer learning. Through fine-tuning and data augmentation, transfer training is implemented on AlexNet by return the endmost layer with a softmax to categorize three distinct lesions (melanoma, frequent nevus, and atypical nevus).

L. Riaz et al.[6] proposed Skin diseases must be identified early to reduce skin lesion growth and spread. The medical field has a expressive dependency on Information Technology and in this era, there is require for a mechanism that can find skin diseases at an origin stage with higher accuracy capable as working with rapidly growing data a cooperative learning platform integrating CNN technology and Local Binary Pattern (LBP). The process involves extracting features through both CNN and LBP architectures, followed by concatenating all the extracted features. The suggested system is trained and check using the widely used publicly accessible dataset toward skin cancer noticed to solve multiclass skin disease issues. Furthermore, a contrast of results is developed between the architectures and their fusion.

P. Tschandl et.al. [7] proposed The difficulties in training neural networks towards the motorized diagnosis of colored skin injury stem from the constrained size and insufficient diversity present in current datasets of dermatoscopic images. To address this concern, we introduced the HAM10000 dataset, labeled as "Human Against Machine with 10000 training images." This dataset holds dermatoscopic images sourced from diverse populations, obtained and stored through various modalities. To enhance diversity, unique acquisition and cleaning methods were applied, and semi-automatic workflows utilizing specially trained neural networks were developed. The developed dataset comprises 10,015 dermatoscopic images, Provided as a preparation set for academic machine learning initiatives, the dataset, titled HAM10000, is openly accessible through the ISIC archive.

M. A. Albahar et.al. [8] provided Skin cancer, primarily diagnosed through visual examination involving clinical screening, dermoscopic analysis, histopathological assessment, and biopsy, encounters challenges in automated classification due to nuanced differences in lesion appearance. Deep CNN are working to address the particular challenges and achieve highly segregated and potentially general tasks for finely grained object categorization. This paper introduces a novel prediction model that classifies skin injury as each of benign or malignant, utilizing a unique regularizer technique. Essentially, this model work as a binary classifier, discerning between benign and malignant lesions.

3. CONCLUSION

As the occurrence towards skin cancer increases, developing and implementing a structure for skin disease detection through image rectifying and machine learning represents a significant advancement in diagnostic and therapeutic approaches. This innovative method harnesses technology to generate a more precise and efficient means of identifying skin diseases, ultimately enhancing patient care, treatment, and outcomes. By integrating image rectifying techniques, including division and quality extraction, and employing advanced machine learning algorithms, we have demonstrated the capability to automate and enhance the diagnostic procedure. This not only reduces the not only alleviates the workload on healthcare professionals but also guarantees a quicker and more dependable diagnosis—an essential part in the prompt rectifying and attention of skin cancer.

REFERENCES

[1] Krishna Mridha , M D .Mezbah Uddin , Jungpi Shin , Susan Khadka and M. F. Mridha (2023), “An Interpretable Skin Cancer Classification Using Optimized Convolutional Neural Network for aSmart Healthcare System”, International journal of biomedical imaging. 2013. 323268. 10.1155/2013/323268.

[2] Marwan Ali albahar "A comprehensive survey on image-based computer aided diagnosis systems for skin cancer," 2019 International Conference on Software ,2019,

[3] H. L. Gururaj ,N. Manju , A. Nagarjun, V. N. Manjunath Aradhya, And Francesco Flammini. “Deep Skin: A Deep Learning Approach for Skin Cancer Classification”(2023)

[4] Rehan Ashraf, Sitara Afzal and , Attiq ur Rehman, Sarah gul, Junaid Baber" Region-of-Interest Based Transfer Learning Assisted Framework for Skin Cancer Detection,"(2020)

[5] S. R. Guha and S. M. Rafizul Haque, " Skin Lesions Classification into Eight Classes for ISIC 2019 Using Deep Convolutional Neural Network and Transfer Learning," .2020.3003890

[6] Lubna Riaz, Hafiz Muhammad Qadir , Ghulam Ali. Mubashir Ali, Muhammad Ahsan Raza and Jehad Ali “A Comprehensive Joint Learning System to Detect Skin Cancer.” (2023)

[7] P. Tschandl, C. Rosendahl and H. Kittler, "The HAM10000 dataset a large collection of multi-source dermatoscopic images of common pigmented skin lesions", Scientific Data, vol. 5, no. 1, pp. 1-9, Aug. 2018.

[8] M. A. Albahar, "Skin lesion classification using convolutional neural network with novel regularize", IEEE Access, vol. 7, pp. 38306-38313, 2019.

[9] C. Barata, J. S. Marques and M. E. Celebi, "Deep attention model for the hierarchical diagnosis of skin lesions", Proc. IEEE/CVF Conf. Compute. Vis. Pattern Recognition. Workshops (CVPRW), pp. 1-9, Jun. 2019.

[10] N. Nigar, M. Umar, M. K. Shahzad, S. Islam and D. Abalo, "A deep learning approach based on explainable artificial intelligence for skin lesion classification", IEEE Access, vol. 10, pp. 113715-113725, 2022.

[11] A. Chattopadhay, A. Sarkar, P. Howlader and V. N. Balasubramanian, "Grad-CAM++: Generalized gradient-based visual explanations for deep convolutional networks", Proc. IEEE Winter Conf. Appl. Compute. Vis. (WACV), pp. 839-847, Mar. 2018.

[12] M. Vidya and M. V. Karki, "Skin cancer detection using machine learning techniques", Proc. IEEE Int. Conf. Electron. Compute. Commun. Technol. (CONECCT), pp. 1-5, Jul. 2020.

[13] S. Aswath and M. Kalaiyarivu Cholan, "Classifying Skin Cancer Images Based on Machine Learning Algorithms and a CNN Model", Algorithms for Intelligent Systems, 2022.

[14] R. S. Sanketh, M. Madhu Bala, P. V. Narendra Reddy and G. V. S. Phani Kumar, "Melanoma Disease Detection Using Convolutional Neural Networks", 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS), pp. 1031-1037, 2020.

[15] R. Zhang, "Melanoma Detection Using Convolutional Neural Network", 2021 IEEE International Conference on Consumer Electronics and Computer Engineering (ICCECE), pp. 75-78, 2021.