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# Skin Cancer Detection and Classification Using Deep Learning

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***Abstract: Skin cancer is the most prevalent type of cancer worldwide. Early skin cancer identification is essential for effective therapy ,and computer-aided diagnosis systems can improve the precision and effectiveness of diagnosis. In this study, a Convolutional Neural Network (CNN) is developed for skin cancer detection. The CNN is trained on a dataset of skin lesion images to classify the lesions as either cancerous or noncancerous. The proposed model achieved an accuracy of 90% in classifying skin rashes as benign or malignant, demonstrating its potential as a tool for skin cancer detection. Skin cancer is the out-of-control development of unusual cells in the epidermis, the outermost skin layer, brought about by DNA harm that causes harmful variations. Despite consistent upgrades in medication, skin cancer is still an issue. Consequently, the insights by the Skin Cancer Foundation, one of every five Skin cancer will occur in people by age seventy. The project expects to plan a framework that will be adequately proficient to distinguish the occurrences of different sorts of skin malignancy in the body by extracting significant patterns from the dataset.***

## I. INTRODUCTION

The most widespread and common type of cancer in the world is skin cancer. Each year, doctors detect more than 3.5 million cases of melanoma, Squamous cell cancer and basal cell carcinoma. This number exceeds the sum of cases of breast, lung, and colon cancer. In actuality, a melanoma victim is lost every 57 seconds. [5] The best chance of a full recovery from skin cancer, as with all types of cancer, is early screening and identification. A 94% ten-year survival rate for skin cancer is achieved with early identification. However, as the cancer advances and enters the latter stages, this survival percentage dramatically decreases.[5]. With around one-third of all cancer diagnoses, skin cancer is the most prevalent type of cancer in the globe. Skin cancer early detection is essential for effective treatment and better patient outcomes. However, conventional means of skin cancer detection, like a dermatologist's ocular examination, can be laborious and unreliable. The use of computer-aided diagnosis methods to increase the precision and effectiveness of skin cancer diagnosis has gained popularity in recent years. A deep learning system known as convolutional neural networks (CNNs) has demonstrated potential in the detection of skin cancer from medical photographs. This approach was tested on 10000 training photos for Human vs. Machine (HAM10000) dataset.[7].

HAM10000 dataset is a collection of different types of images of skin cancer. They collected a large number of skin samples from different areas, acquired and have been put in various senses. The finalized dataset consists of 10015 skin cancer images which are generally used to train algorithms for deep learning and can be used in various computer vision applications. Dataset contains images of 7 types of skin cancer Actinic keratoses(acc)and basal cell carcinoma ( bcc), benign keratosis ( bkl), dermatofibroma ( df), melanoma (mel), melanocytic nevi ( nv) and vascular lesions (angiomas, angiokeratomas, pyogenic granulomas and hemorrhage, vasc) [9].

| lesion_id | image_id | dx | dx_type | age | sex | localization |
|---|---|---|---|---|---|---|
| HAM_0000118 | ISIC_0027419 | bkl | histo | 80 | male | scalp |
| HAM_0000118 | ISIC_0025030 | bkl | histo | 80 | male | scalp |
| HAM_0002730 | ISIC_0026769 | bkl | histo | 80 | male | scalp |
| HAM_0002730 | ISIC_0025661 | bkl | histo | 80 | male | scalp |
| HAM_0001466 | ISIC_0031633 | bkl | histo | 75 | male | ear |

Table 1:HAM10000 dataset metadata

## II. PROBLEM STATEMENT

With more instances being discovered each year, skin cancer is a serious issue for world health. Skin cancer early detection is essential for effective treatment and better patient outcomes. However, conventional techniques for finding skin cancer, such a dermatologist's eye examination, can be laborious, subjective, and subject to human error. Additionally, many areas lack access to dermatologists and specialised healthcare facilities, which delays diagnosis and treatment.

## III. OBJECTIVES

1) The study aims to develop a more accurate and efficient technology for the identification of skin cancer that can aid in its early detection and treatment.
2) Such a system has the potential to significantly improve the accuracy and efficiency.
3) Moreover, it can reduce the burden on healthcare systems and improve patient outcomes by enabling early identification and prompt skin cancer therapy.

## IV. LITERATURE SURVEY

In this study, we present an automatic melanoma diagnosis and inspection system that supports photos of skin rashes taken using a conventional (consumerlevel) digital camera. This makes it possible to estimate one's own chance of developing melanoma, which boosts the classification's accuracy. We discovered that our system correctly categorised photos 86% of the time, with 94% sensitivity and 68% specificity[1]

Malignant melanoma screening and early detection hold tremendous promise for image-based computer aided diagnosis methods.[1] We cover the present state of the art for these systems and look at existing procedures, issues, and future plans for dermoscopic image capture, pre-processing, segmentation, feature extraction, and classification.We analysed the effectiveness of a number of classifiers created especially for diagnosing skin lesions and discussed the corresponding findings.[3].

The most deadly type of skin cancer is melanoma. Melanoma decision support systems are required due to the subjectivity of current clinical detection methods and the increased incidence rates of the disease. A crucial stage in melanoma decision support systems is feature extraction. Low-level features, which exist in high-dimensional feature spaces and restrict the system's ability to transmit meaningful diagnostic justification, make up the majority of the existing feature sets for processing conventional camera photos.The user can therefore receive intuitive diagnostic reasoning in this way. [4]

The majority of researchers have made use of their own information gathered from hospitals. However, their dataset is too small for adequate machine learning training.

The goal of this study is to use machine learning and digital image processing to develop better and more efficient methods of detecting skin cancer. The ultimate goal is to help clinicians identify skin cancer early on by delivering more accurate and dependable results. [10]

## V. METHODOLOGY

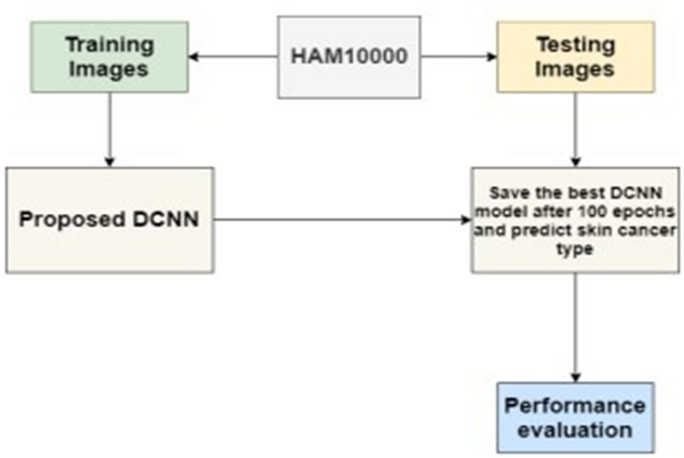


Fig 1:Flowchart of CNN training.

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1) *Step 1:* The initial stage in our research is to get trustworthy data for our deep learning model's training. We like to use the data on skin lesions that is available on the Kaggle data science website.In a block diagram
2) *Step 2:* Preprocessing the acquired data in STEP 2 will help to prevent unforeseen run-time errors as the model is being trained.
3) *Step 3:* Separate the training and testing portions of the data. As the data collected from Kaggle is insufficient for training the deep network model, data augmentation must now be done to expand the quantity of the training data.
4) *Step 4:* Create a neural model in Step 4 to forecast the desired outcomes. We chose the MobileNet model to train on our dataset because this application is designed for smartphones with lower-end specifications.
5) *Step 5:* Develop the model, test it on the validation set, and then assess it using the learning curves that were discovered during training. To deploy this model into the web application, complete
6) *Step 6:* By converting it to a Tensorflow JS model.
7) *Step 7:* At this point, create a web application that can accept skin picture input and display disease probabilities using the included JS model**.**


Fig 2:CNN for skin cancer classification

## VI. WEBCAM

To scan the skin from webcam of laptop, OpenCV is used which streams the video from which image will be captured and sent to CNN model to predict the output.

## VII. EXPERIMENTAL RESULTS AND DISCUSSION

### *A. Performance Comparison*

Our Traditional machine learning was outperformed by the CNN model methods and demonstrated comparable performance to other deep learning-based approaches. Interpretability is lacking, so future research should focus on developing methods to explain the model's decisions. Dataset limitations should be addressed to improve model robustness. The Accuracy of our CNN model achieved an overall accuracy of 90.73% on the test dataset, indicating its effectiveness in skin cancer detection and classification.

| | PRECISION | RECALL | F1-SCORE | SUPPORT |
|---|---|---|---|---|
| ACTINIC KERATOSIS | 0.12 | 0.14 | 0.13 | 77 |
| BASAL-CELL CARCINOMA | 0.14 | 0.15 | 0.15 | 66 |
| DERMATOFIBROMA | 0.09 | 0.09 | 0.09 | 66 |
| HEALTHY | 0.05 | 0.05 | 0.05 | 21 |
| MELANOMA | 0.08 | 0.08 | 0.08 | 66 |
| NEVUS | 0.11 | 0.09 | 0.10 | 66 |
| PIGMENTED BENIGN KERATOSIS | 0.06 | 0.06 | 0.06 | 66 |
| SEBORRHEIC KERATOSIS | 0.08 | 0.08 | 0.08 | 66 |
| SQUAMOUS CELL CARCINOMA | 0.12 | 0.13 | 0.12 | 55 |
| VASCULAR LESION | 0.13 | 0.12 | 0.12 | 66 |
| | | | | |
| ACCURACY | | | 0.10 | 615 |
| MACRO AVG | 0.10 | 0.10 | 0.10 | 615 |
| WEIGHTED AVG | 0.10 | 0.10 | 0.10 | 615 |

Table 2:Results of confusion matrix.

## VIII. CONCLUSION

In this research, we've presented a methodological approach to classify various skin lesions into their respective category with the help of Neural Networks. Neural Networks provide a sophisticated way to classify complex data with a high degree of accuracy. We have classified 10000 pictures into the appropriate category, with an overall accuracy rate 90.73% when compared with the other technique

## IX. FUTURE SCOPE

Encouraged by these outcomes, subsequent work will involve the improvement of classification result and overall accuracy. The number of output classes can also be increased as more data is available. Convolutional Neural Network (CNN) One can use models for performing this classification without segmentation and extraction of features independently. The input images can be directly fed to the CNN model, which would perform the classification automatically and give better results.

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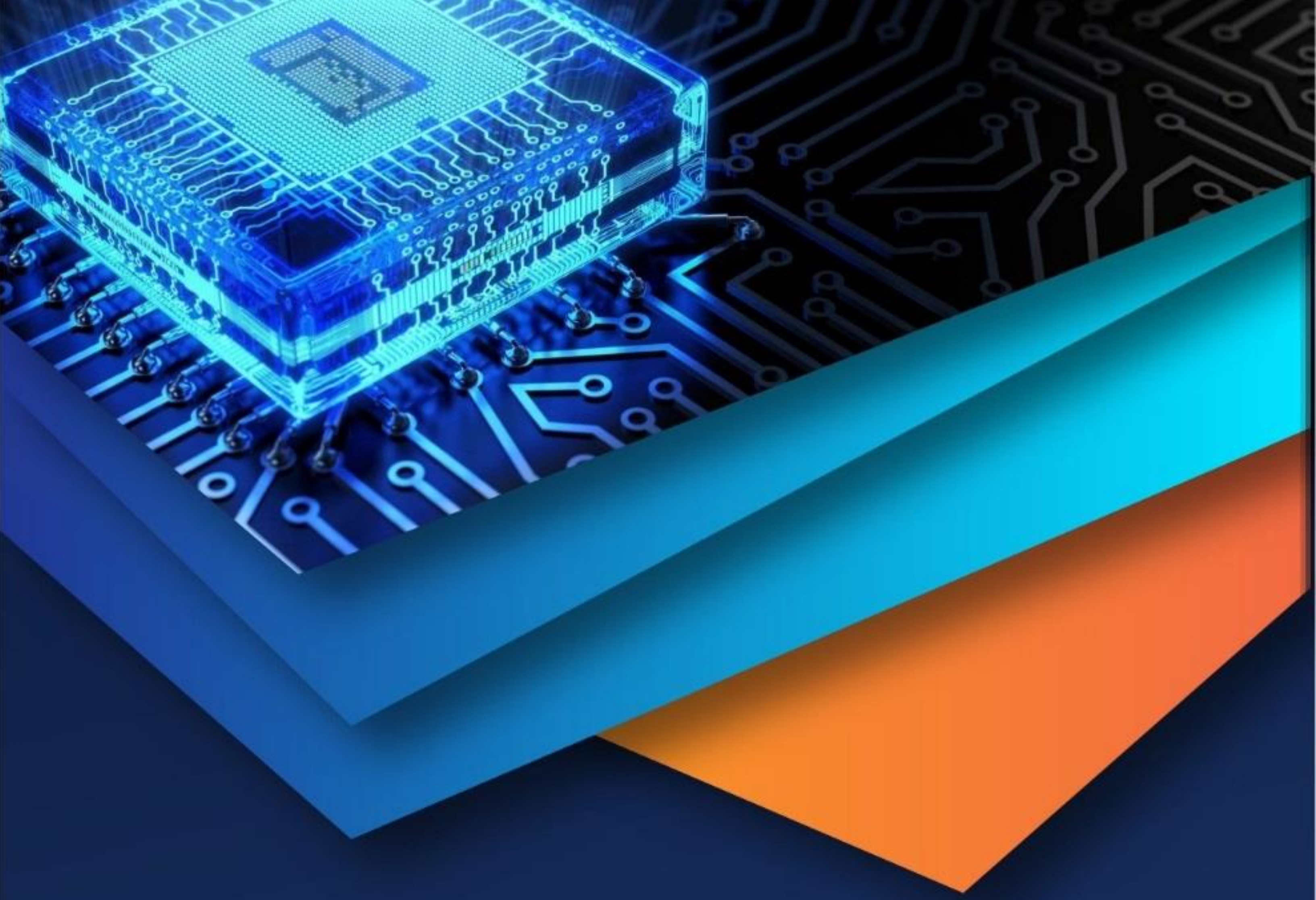


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