

Skin Cancer Prediction Using Deep Learning Techniques

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Abstract— Skin cancer is the one of ten most common cancer types in the world. The abnormal growth of skin cells most often develops on the skin exposed to the sun. Skin cancer occurs when errors occur in the DNA of skin cells, it begins at the top of the skin. There are three types of skin cancer they are 1. Melanoma 2. Basal cell Carcinoma 3. Squamous cell skin cancer. The mutation causes the cells to grow out of control and form a mass of cancer cells. Melanoma is the most dangerous skin form of skin cancer when compared to the other types. The main symptom of skin cancer is a mole are other growth on our skin. Skin cancer symptoms include darker looking skin yellowish and eyes reddened skin, itching and excessive hair growth. There is proper technique followed to reduce the skin cancer by limiting or avoiding exposure to ultraviolet (UV) radiation. Detection of skin cancer at an earlier stage can increase the survival rate. When compared to the ancient days the rate of skin cancer peoples is increased significantly, due to modern techniques and lifestyles, direct exposure to harmful UV radiation from sun. It was estimated that in the year 2022 around 57,180 men's and 42,600 women's would develop Melanoma of skin.

In the case of positive skin cancer, determining the type is very important because it helps to identify the most suitable treatment. In recent times the usage of image processing and mission vision in the field of health care and medical applications is increasing at a great face. In this paper we are using the convolution neural network (CNN) to detect and classified the clause of cancer based on historical data of clinical images using RESNET.

Keywords— Skin Cancer, Convolutional Neural Network, Neural Network

I. INTRODUCTION

Skin is sensible organ for all the living organs and plays an important role. Skin is the major part, that which protect and disallow any bad symptoms into the body and protect from injuries, it stores the water. Skin is made up of three layers they named as 1. Epidermis, 2. Dermis, 3. Hypodermis. So, it functions as follows:

1. *Epidermis*: It is the outer most layer of the skin and does not allow any bacteria and if any injuries occurs then it is the main responsible one to clot the blood. It is made up of the four layers, it is responsible for the skin color.

2. *Dermis*: It is the central layer of the skin and from

this layer the growth of hair begins and it stores heavy minerals. This layer is elastic in nature.

3. *Hypodermis*: It is also called as Subcutaneous tissue; it is a thick and last layer of the skin. It protects from injuries and inner organs.

Skin cancer is start with the tumors by this the it develops the growth and spread throughout the body and it shows the effect on the skin. so, it is under melanoma type. Skin cancer effects or spreads the body is depends upon the type of the skin. They are of three types Squamous cell carcinoma, Basal cell carcinoma, Melanoma. Squamous and Basal is the not much danger when compared with the melanoma and the skin cancer can be reduce or cured by dermatologist, surgeon or radiated. Melanoma is the most dangerous one when compared with the other type of skin cancer, early detection of the melanoma type is very important symptoms that is growth of the mole on the skin. CNN is the methodology used to detect the skin cancer in the various part of the body. It consists of different layer by this it can identify the types of skin cancer

Around 20% Americans developed skin cancer in their lifetime and 9,500 are suffering from the skin cancer. There some and good benefits with the early prediction of the melanoma that there is a chance of 99% to alive and recovery from the melanoma. So, melanoma is most dangerous and early treatment is must. At the starting stage skin color is diagnosed and following very stages is very difficult to treatment.

Risk:

- Spending more amount of time in the UV light coming from sun.
- Smoking heavily, fall of hair and change of color.
- Growth of moles and different shapes.
- Family history of skin cancer etc.

Convolution Neural Network (CNN) involves are used for identifying the melanoma images. It works as follows it takes input image from the user and analyses on basis of hidden convolutional layer by this it detects the pattern and growth of melanoma skin cancer. The algorithm identifies or

capture the important objects from the image and differentiate, it detects the pattern and make sense of them. Based on over 20,000 images from 133 patients, by the available data MIT scientists developed a trained CNN system. From this they developed image from smartphone camera that shows large section of a patient's skin.

II. LITERATURE SURVEY

In the year 2021 Y. Jusman were used Deep neural network for skin cancer Detection and they used HAM10000 data set by this they have gained Multilayer Perceptron and Deep Neural Networks. By this they have trained Transfer Learning for any further reading refer [1]

In the year 2021 R. Raja Subramanian were used Convolutional Neural Network (CNN) for skin cancer Detection and they used HAM10000 data set by this they have gained Accuracy (83.11%), F score (0.82797 %) precision (0.818642 %), recall. By this they have trained original images for any further reading refer [2]

In the year 2020 Hari Krishan Kondaveeti were used Transfer Learning for skin cancer Detection and they used HAM10000 data set by this they have gained recall. By this they have trained Neural Network on 30 epochs and categorical accuracy for any further queries refer [3].

In the year 2020 Nourabuaed used VGG19 and Transfer Learning for skin cancer Detection and they used HAM10000 data set by this they have gained Proposed Strategy. By this they have trained Relaced last layer of the Deep CNN with a Soft max layer for any further reading refer [4]

In the year 2019 Emara were used A Modified Inception_V4 for skin cancer Detection and they used HAM10000 data set by this they have gained Model Classification. By this they have trained Image net Data Set for any further details refer [5]

In the year 2019 Ahmed Demir were used Deep Learning Architectures: Resnet_101 and Inception-V3 for skin cancer Detection and they used Biomedical data set by this they have gained ResNet_101 Model. By this they have trained Two different Deep Learning Methods for any further queries refer [6]

In the year 2021 A Javaid were used Machine Learning for skin cancer Detection and they used ISIC-ISBI data set by this they have gained Trained Algorithm itself as a part of the evaluation Function. By this they have trained Benign data for any further clarification refer [7].

CNN is introduced by Yann Lecun's in the year 1980's. CNN stands for (Convolution Neural Network) is a type of artificial neural network that is used for image recognition. CNN is design that automatically learns the hierarchies' new features by using multiple building blocks as convolution network. It consists of two layers those are input layer and output layer. When you give input to the CNN it performs several activities and that are passes for further layers. It required large amount of data for training and also for testing. It work's based on the confusion matrix in this it contains three layers they named as RGB. Where the output is passed into the next layer by generating multiple features.

The First layer extracts the basic features like horizontal or diagonal edge. Where the output is passes into the next layer. In the next layer which detect more complex features like corners or combinational edges and as we move for further into the network it can detect more complex features like objects, faces etc... so this is the working happen behind the CNN so based on the three layers it recognizes image and gives the output. The details survey is shown in table 2.1.

TABLE 2.1: RELATED WORKS

Ref No	Method	Data set	Performance
1	Multilayer perceptron and Deep Neural Network	HAM10000	Accuracy (74.75%) UGC (81.46%) Sensitivity (90.09%)
2	Convolutional Neural Network (CNN)	HAM10000	Accuracy (83.11%) , F1 score (0.827) precision (0.818),
3	Transfer Learning	HAM10000	Accuracy (90%) Recall (0.90%)
4	VGG19 and Transfer Learning	HAM10000	Training Accuracy (0.985) Testing Accuracy (0.975)
5	A Modified Inception_V4	HAM10000	Accuracy (82.89%)
6	Artificial Neural Network, SVM, Back-Propagation Neural Network	DermIS, DermQuest	BNN Accuracy (89.9%) AANN Accuracy (80.8%)
7	SVM, KNN	ISIC-ISBI	KNN Accuracy (86%) SVM Accuracy (87.5) SVM+KNN Accuracy (94%)
8	Diagnostic Algorithm	Image dataset	Accuracy (93.3%)
9	CNN	ISIC	Accuracy (71%), sensitivity (0.68) Specificity (0.74) F1 score (0.7)
10	Multilayer Decomposing aided	SCD	Accuracy (Melanoma [97.1%]), Accuracy (non melanoma [95.6%])
11	SVM and KNN	1. Dermoscopic 2. Histoapathological	Accuracy (94%)
12	KNN & Decision Tree & SVM	ISIC	Accuracy (KNN [76.4%]) (Decision Tree [76.4%]), (SVM [78.2%])
13	Deep Learning	HAM10000	Accuracy (94%)
14	Neural Network	463 images	Accuracy (76.9%)
15	SVM and RANDOM FOREST	ISIC-ISBI	Accuracy (93.89%)

III. IMPLEMENTATION AND RESULT DISCUSSION

The below sample of images from Fig 3.1 are collected for testing as well as training. It includes different types of skin cancer type sample images. with this image we will train the system after we will test the system by giving some another sample of images. we consider 10,000 images for both training and testing. From 10,000 we consider a greater number of images are melanoma skin cancer type. Because it is the most dangerous when compared to other type of skin cancer. From the below Fig 1 you can easily understand that Melanocytic nevi is most common disease that spread in range between 6000 to 7000. Dermatofibroma is less spread when compared with other. so, melanoma is the second largest one and it is most dangerous it spread 10% people from 10,000 people.

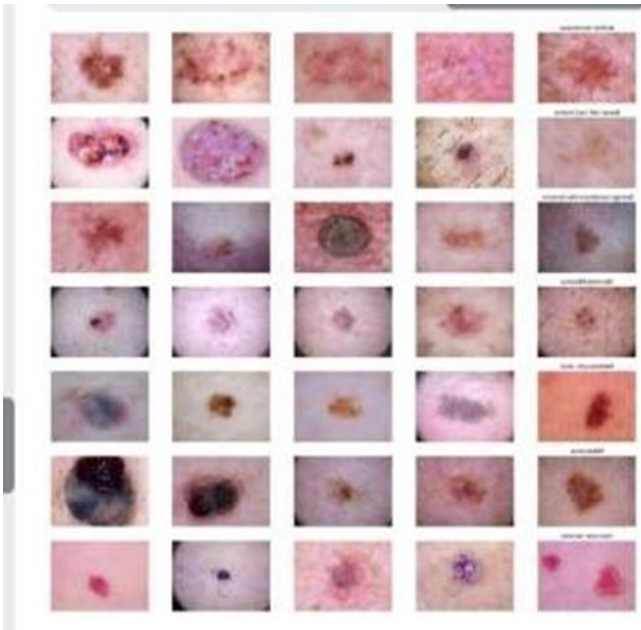


Fig. 1. Different types of image samples of skin cancer

From the below Fig 1 you can easily understand that Melanocytic nevi is most common disease that spread in range between 6000 to 7000. Dermatofibroma is less spread when compared with other. so, melanoma is the second largest one and it is most dangerous it spread 10% people from 10,000 people.

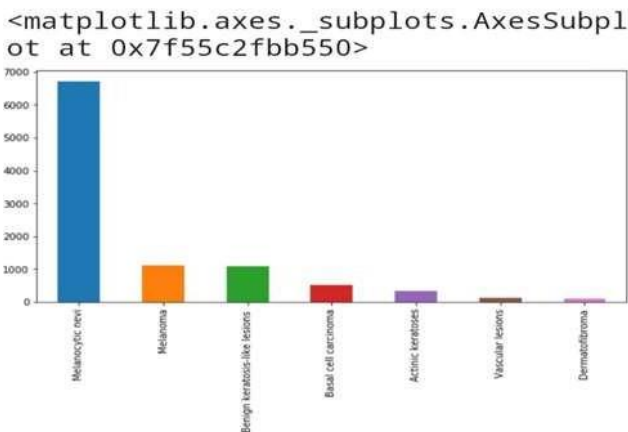


Fig. 2. Visualization of different types of skin cancer

From the below Fig 3 bar-graph it mentioned various types of body part and level of spread of skin cancer in various type of body parts it clearly observed that back of the body skin cancer is mostly spread when compared with the other body parts. It rarely spread in the acral body part.

The below Fig 4 shows the different type of persons age suffer with the skin cancer and the spread of skin cancer is more in between range from 30 to 60.

Below Fig 5 shows the confusion matrix and the calculated accuracy, precision, True positive rate and True negative rate. Fig 6 represents the accuracy plotted against the number of epochs. Blue color represents the training accuracy curve, whereas orange represents testing accuracy.

Also, Fig 6 represents the accuracy measured using the RESNET -50 model. Fig 7 indicates the training loss and testing loss obtained for the constructed model.

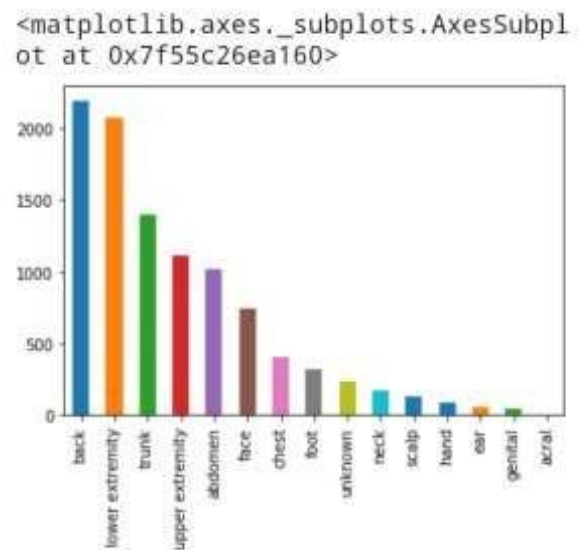


Fig. 3. Visualization of skin cancer in different parts of body

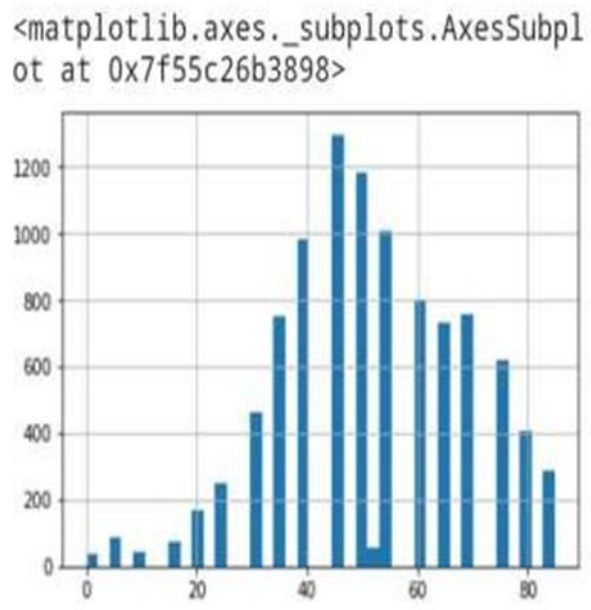


Fig. 4. Visualization of skin cancer among different ages

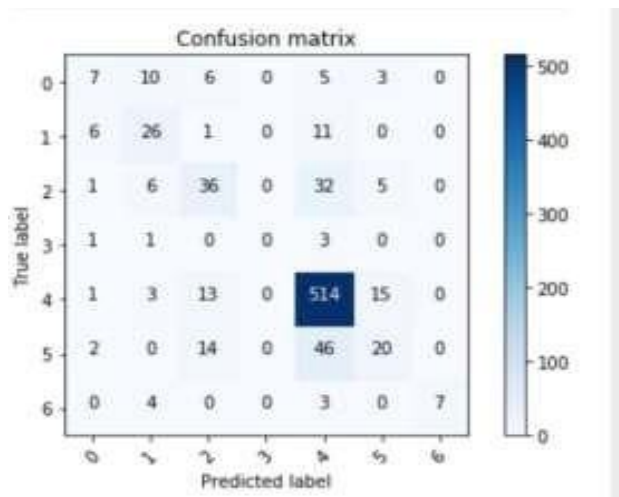


Fig. 5. Confusion Matrix

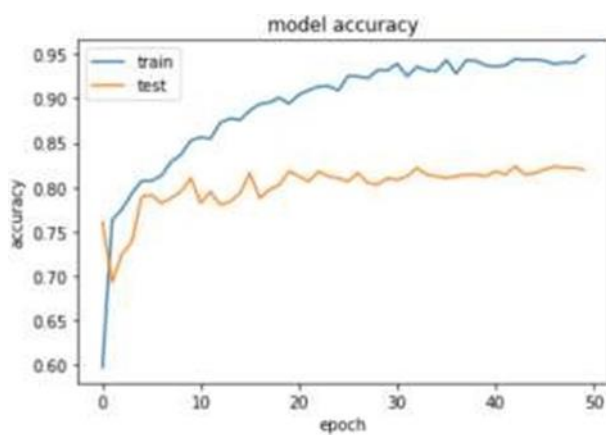


Fig. 6. Model Accuracy Using RESNET 50

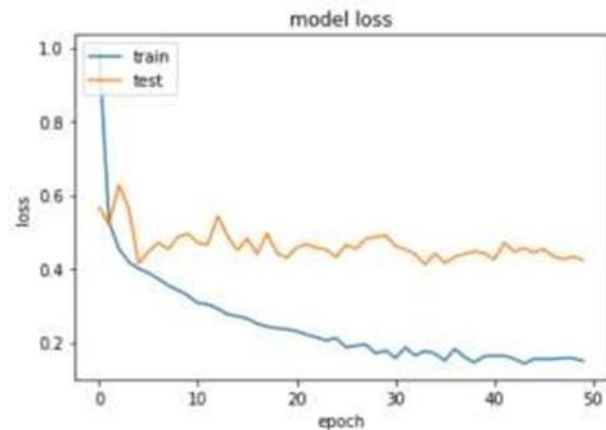


Fig. 7. Model Loss Using RESNET 50

IV. CONCLUSION

From the analysis made above, it's very clear that RESNET - 50 out performs the detection of the skin cancer with an average testing accuracy of 82.87%. Also, the loss of the model drops drastically from 0.7 to 0.4 which is clearly illustrated in the Fig 8. We conclude that if the model was hyper tuned further the accuracy and loss can be improved.

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