A NOVEL APPROACH FOR EARLY PREDICTION OF MELANOMA USING DEEP CNN TECHNIQUES

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***Abstract*:** One of the most common types and the most lethal form for cancer of skin are the Melanoma and Basal Cell Carcinoma. Early detection of melanoma that too in early stages is always treatable with minor surgery. Effort has been taken to study melanoma systematically in the project. Melanoma is studied using wider, deeper, and high-resolution images with deep CNN techniques that provide better performance and accurate results. The dataset collected is augmented using suitable transformations and the system is evaluated using a variety of metrics. The over-elaborate skin cell's features are extracted using a fitting feature extraction technique and are segmented. We use several models in this implementation, and the results are analyzed based off of the metrics. The model that performs the best is chosen as the best performing model. The proposed system is tested on a large dataset to obtain the best results. Based on metrics, we compare the different models used in this application and find the most efficient one. The new system is put to the test on a huge database, and the results are received.

Keywords: *Melanoma, Actinic Keratosis, Basal Cell Carcinoma, Dermatofibroma , Convolutional Neural Network ,Skin Cancer, Malignant, Benign, Skin Lesion, American Cancer Society*

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INTRODUCTION

One of the most common types and the most lethal form for cancer of skin are the Melanoma and Basal Cell Carcinoma. Early detection of melanoma that too in early stages is always treatable with minor surgery. Effort has been taken to study about melanoma systematically in the project. Melanoma is studied using wider, deeper and high-resolution images with deep CNN techniques that provides better realization and accurate results. The dataset collected is augmented using suitable transformations and the system is evaluated using a variety of metrics. The over-elaborate skin cell's features are extracted using a fitting feature extraction technique and are segmented. We use several models in this implementation, and the results are analysed based off of the metrics. The model that performs the best is chosen as the best performing model. The proposed system is tested on a large dataset to obtain the best results .Based on metrics, we compare the different models used in this application and find the most efficient one. The nicest way to handle with that be try to see it early and treat it with a little surgery. Following the dissociation of the Skin Lesion pictures, the afflicted skin cells' properties are erased using the feature removal technique. The several models used in this application are compared using metrics in order to discover the best effective model. The upgraded method is put to the test on a huge database, with positive results .Advanced stage melanoma and basal cell carcinoma, on the other hand, have a high chance of spreading and are consequently difficult to cure. As a result, it's critical to diagnose a skin lesion that could indicate the presence of melanoma as soon as feasible. Even current procedures that don't require a sample of skin are time- consuming and expensive for dermatologists .Current procedures for diagnosing melanoma are inconvenient and require the excision of a sample of skin. Based on these findings,

computer-aided image classification provides an effective method for detecting melanomas and basal cell carcinomas.

The convolutional neural network, or CNN, is the acquisition of in-depth neural network information designed to process systematic mathematical lists including exposure. CNN is very happy to choose the composition within the embedded image, as well as the types, gradients, circles, or perhaps eyes and faces. This is a feature that makes the convolutional neural network very strong in computer thinking and science. The Xception Model is proposed by Francois Chollet. Xception stands for "extreme inception," and it pushes Inception's concepts to their limits. Xception is a 71-layer convolutional neural network that augments the Inception Architecture by substituting depth wise Separable Convolutions for the usual Inception modules. Google considers inception modules in convolutional neural networks to be a step between conventional convolution and depthwise separable convolution.Adam optimizations are stochastic gradient descent variations that have recently gained traction in computer vision and natural language processing applications

LITERATURE REVIEW

For cancer diagnosis and diagnosis, there is a lot of in- depth reading and machine learning techniques accessible. The Convolutional Neural Network, Recurrent Neural Network, and Alex Net, VGG19, ResNet, VGG16, and Xception are some of the most extensively utilised in-depth study methodologies for identifying skin cancer. HAM10000 and CSV data are two of the most extensively utilised data sets for training and testing. [9].

Vimal et.al., developed a classification system that can discriminate between benign and malignant skin lesions using Deep Learning methods. Researchers Aburaed, Panthakkan, Al-Saad, Amin, and Mansoor used the HAM 10000 datasets to display a cancer of skin classification technique. [1]. A new hybrid method for classifying and segmenting benign and malignant skin lesions has been developed by Shah, Autee, and Sonawane [2].Image processing techniques and an efficient diagnosing system is introduced by Support vector machine (SVM)algorithms [3]. Talavera-Martnez, Bibiloni, and González- Hidalgo.G suggested a deep learning-based strategy to apply with augmentation and analyses network designs for melanoma diagnosis on dermoscopic picture with 83.30 percent accuracy[4]. The authors Z. Jiahao, et.al., introduced the Enhanced classification accuracy is achieved with an efficient-net-based deep learning system that augments data during training and test data during inference using effective data enhancement techniques. For establishing physician therapy for decision, the encoder and decoder network approaches was developed by Yinchong Yang.[6]

A computer-aided detection method with limited supervision that takes into account and analyses characteristics of cancer pictures such asymmetry, border irregularity, compact index, fractal dimension, edge abruptness, colour change, and diameter, SVM images and Snake active contours was developed by P. Bumrungkun, Chamnongthai and Patchoo using Support Vector Machine (SVM) models, and features of cancer images such as SVM images and Snake active contours. According to Azadeh et.al., [7], their final goal is to review the research done on skin cancer detection and determine whether automatic detection of skincancer is possible

EXPERIMENT AND PROPOSED METHODOLGY

In this method, accustomed a convolutional neural network (Xception model) to diagnose skin cancer and implemented a dataset on skin lesion. We've accustomed the Kaggle Datasets which is publicly available for a experimenter . The first part of the experiment , we've digest the datasets and extracted applicable features using watershed and histogram model, encoder is implemented then build the final training dataset. Used a D-CNN algorithm for the trained dataset and to achieve 90% accuracy.

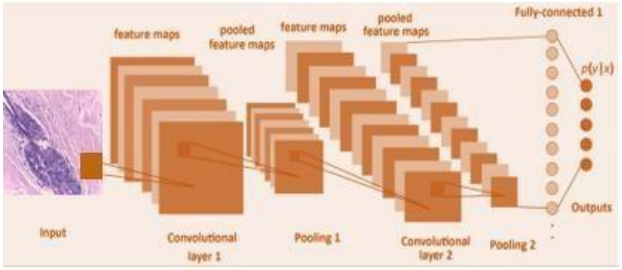


Fig .1

S.No	Model	Input Image	Accuracy
1	Decoupled DC-GAN along ResNet-50	ISIC-2017	87%
2	NABLA-N withIRRCNN	ISIC-2018	86.6%
3	SVM algorithm And Snake Model	HAM10000	80%
4	Convolutional Neural Networks	Asan	82%
5	Sequential Minimal Optimization	Edinburgh	75%
6	Optimized ensemble	ISIC 2019 Task 1& Task2	75%

Dataset Collection

Based on discussion of the ISIC 2020 dataset and a piece of it, we have compiled our data. Approximately 16,973 skin lesions, including melanoma, actinic keratoses, basal cell carcinoma, and dermatofibromas, were included in the ISIC-2020 dataset, comprising 4514 images of actinic keratoses, 4372 images of basal cell carcinoma, 3693 images of dermatofibromas, and 4394 images of melanoma. There are no artefacts in this dataset to obscure the skin lesions, which makes it more accessible than many of its counterparts. Moreover, the skin lesion's microstructures are distinct and visible. Feature extraction is thus more effective

Actinic Keratosis

Fig 2.1 Shows a rough, scaly area on the skin called an actinic keratosis develops after years of sun exposure. An actinic keratosis, or sun keratosis, typically appear after the 40'sand develop slowly. To reduce your risk of cancer of skin ,limit the amount of time you spend in sun and protect your skin from UV(ultraviolet radiation).

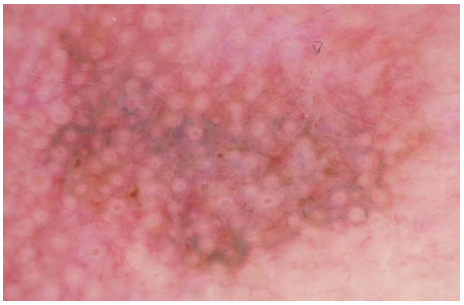


Fig 2.1: Actinic Keratosis

Derma to fibroma

Dermatofibroma is a kind of skin cancer that mostly affects the extremities in Fig2.2 (especially the lower legs) and generally asymptomatic, however it can cause itching and discomfort. Dermatofibroma has several

well-defined histologic subgroups. The tumour is typically not removed unless there is considerable dispute about the diagnosis or theSymptoms are extremely uncomfortable.

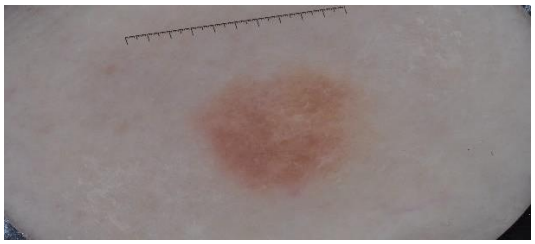


Fig 2.2: Dermatofibroma

Basal Cell Carcinoma

Basal cell carcinoma is a kind of skin cancer that develops in the basal cells, which are responsible for replacing dead skin cells with new ones. Basal cell carcinoma can present in a variety of ways, but the most typical one is as a small, clear lump on the skin. Fig 3.

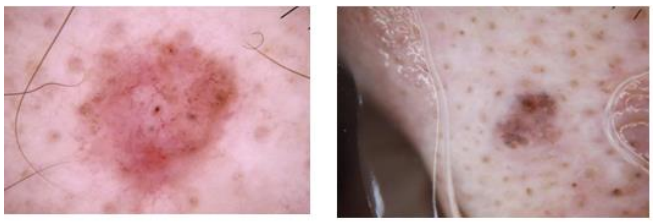


Fig 3: Basal Cell Carcinoma

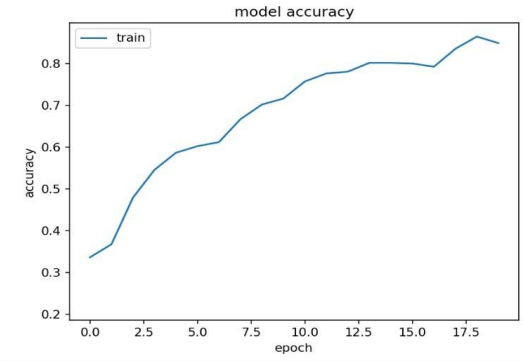
Melanoma

Melanin, the skin's pigment, is generated by the melanoma-causing cells. The ultraviolet (UV) light from sunlight, tanning beds, and tanning lamps increases your chance of getting melanoma even though there is no known cause for these malignancies. Fig 4.

Fig 4: Melanoma

These are the most dangerous cancer types. The cancer tissues multiply rapidly, causing much damage and sometimes be fatal. The following are the criteria used to identify the data set:

- Melanocytes
- Basal cells
- Neoplastic
- Keratinocytes



Data pre-processing and augmentation

Pre-processing is a crucial step in the detection process since it reduces noise and enhances the raw image's quality. It must be used to narrow down the search for background anomalies that influenced the result [8]. The objective of this stage is to improve the melanoma image's quality by eliminating unnecessary and unimportant sections of the image's background so that it may be processed further. Using the right preprocessing techniques, the system's accuracy may be greatly enhanced[11].Cropping, scaling, altering contrast and brightness, flipping horizontally and vertically, and combining these techniques are just a few of the enhancementoptions available.

Training

Skin lesions are categorized into three types based on deep learning CNN models pre-trained with Xception [16] melanoma, actinic keratoses, and dermatofibromas. In this case, transfer learning was applied since the Xception Model was initially trained to identify objects, which is closely related to the classification of skin lesions. A binary classification-specific layer replaced the last entirely linked layer in the Xception Model, softmax, and the classification layers. Each photograph was reduced in size to 227x227 pixels in order to match the input size for the Xception Model [17]. Using the Adam algorithm, a model was trained over 40 training epochs with a learning rate of 0.0001 and a batch size of 30. Trial and error was used to find these qualities.

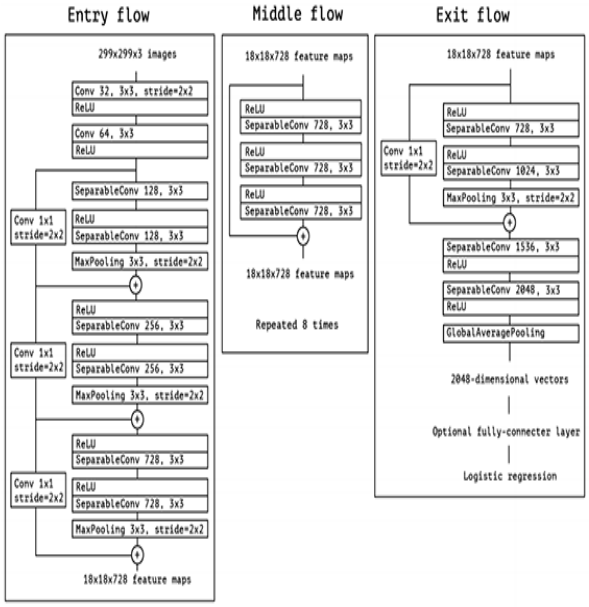
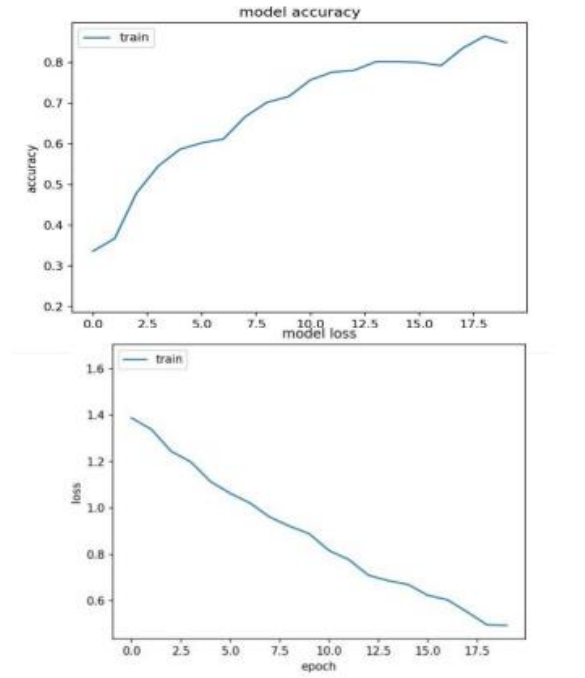


Fig. 5: Architecture of Xception Model

RESULTS

After the completion of modules one after the another and the accuracy of the given data set is found and the best algorithm. The output is given ad reference in Fig.6.




```
Model: "model"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_1 (InputLayer)        [(None, 128, 128, 3)]     0

 xception (Functional)       (None, 4, 4, 2048)        20861480

 global_average_pooling2d (G  (None, 2048)             0
 lobalAveragePooling2D)

 concatenate (Concatenate)   (None, 2048)              0

 dropout (Dropout)           (None, 2048)              0

 dense (Dense)               (None, 4)                 8196

=================================================================
Total params: 20,869,676
Trainable params: 20,815,148
Non-trainable params: 54,528
_________________________________________________________________
Epoch 8/20
32/32 [==============================] - 226s 7s/step - loss: 1.0754 - accuracy: 0.5938
Epoch 9/20
32/32 [==============================] - 312s 10s/step - loss: 1.0065 - accuracy: 0.6348
Epoch 10/20
32/32 [==============================] - 285s 9s/step - loss: 0.9452 - accuracy: 0.6830
Epoch 11/20
32/32 [==============================] - 231s 7s/step - loss: 0.8923 - accuracy: 0.7207
Epoch 12/20
32/32 [==============================] - 227s 7s/step - loss: 0.8317 - accuracy: 0.7926
Epoch 13/20
32/32 [==============================] - 226s 7s/step - loss: 0.8098 - accuracy: 0.7730
Epoch 14/20
32/32 [==============================] - 226s 7s/step - loss: 0.7577 - accuracy: 0.7773
Epoch 15/20
32/32 [==============================] - 226s 7s/step - loss: 0.7253 - accuracy: 0.7773
Epoch 16/20
32/32 [==============================] - 226s 7s/step - loss: 0.6785 - accuracy: 0.8121
Epoch 17/20
32/32 [==============================] - 226s 7s/step - loss: 0.6266 - accuracy: 0.8337
Epoch 18/20
32/32 [==============================] - 226s 7s/step - loss: 0.5936 - accuracy: 0.8281
Epoch 19/20
32/32 [==============================] - 226s 7s/step - loss: 0.5723 - accuracy: 0.8434
Epoch 20/20
32/32 [==============================] - 227s 7s/step - loss: 0.5441 - accuracy: 0.8513
```

Fig 6: Model Evaluation

CONCLUSION

An straightforward and effective method is provided for categorising skin cancer images from the ISIC-2020 dataset using a relatively small training dataset. Future skin cancer and its types should be quickly predicted by a web application that developed.

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