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Melanoma Cancer Detection using Deep Learning

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Abstract - ***Melanoma may be a disease that death rate is kind of high among the carcinoma types. It's vital to try to the right diagnosis of this cancer type whose danger level is high. Asymmetric shape, heterogeneous color, bigger diameter than 6 mm and untidy borders that will not diagnose melanoma disease by the dermatologists visually are important parameters. Conventional diagnosis method for carcinoma detection is Biopsy method. It is completed by removing or scraping off skin which sample undergoes a series of laboratory testing. It is painful and time consuming one. So for helping patient's computer based detection uses image processing techniques and deep learning (CNN) algorithms for detecting cancer.***

Keywords: **Deep learning, CNN model, pooling layer, fully connected layer.**

1. INTRODUCTION

The most common and prevalent kind of cancer on the planet is skin cancer. More than 3. 5 million cases of melanoma, basal cell carcinoma and carcinoma are diagnosed annually. It often has the amount of carcinoma, carcinoma and colon cancers in addition in fact, an individual falls victim to Melanoma every 57 seconds. Because it is with every sort of cancer, early screening and detection of carcinoma is that the most hopeful sign of creating a full recovery. Early detection of carcinoma yields a ten year survival rate of 94%. However, this survival rate drops drastically because the cancer progresses and reaches subsequent stages .Ten year survival rates come to a 15% within the case of Melanoma, when it's detected within the end . [4] However, early detection of skin cancer is an expensive affair. As skin lesions look quite similar to each other, it is difficult to determine whether a lesion is benign or malignant. Extensive analysis needs to be performed to identify the category of the lesion. Traditionally, an image using a special device, known as a dermatoscope, is taken to study the lesion closely.

Unfortunately, from new algorithms, it has become possible to differentiate between clinically similar skin conditions. These algorithms do not require the images to be taken from special purpose devices, instruments are expensive and not widely available with dermatologists. One of the challenges of visual screening is the visual similarity between skin diseases. In the last few years, significant advancements have taken place in the domain of computer vision. With the advent between clinically similar skin conditions. These algorithms do not require the images to be taken from special purpose devices, such as dreamscapes, and can be applied on images obtained from general purpose cameras. To detect unusual mole characteristics that could indicate skin cancer or melanoma, a search for moles with irregular borders, shapes, colors, and moles with more than 6mm diameter is done. To assess the soreness of the skin and classify it either as melanoma or benign, numerous techniques, including genetic algorithms, artificial neural networks (ANNs),CNNs, ABCDE rule, and support vector machines (SVMs), have been proposed. . All these techniques have been verified as cost-effective, highly efficient, and less painful than conventional medical techniques. [10]

However, in many computer vision problems, it becomes undeniable that both CNNs and deep learning are the technique of choice. The CNN is designed in such a manner to differentiate melanoma from solar lentigo and seborrheic keratosis, which is often difficult. Deep learning is a class of machine learning that uses multiple layers to progressively extract higher level features from the raw input. Convolutional Neural Network (CNN) is a deep learning algorithm used in classification and identification of the disease. CNN is One of the main categories to do image recognition and image classifications.

Fig 1: Malignant Melanoma [1]

Fig 2: Melanoma [1]

2. METHODOLOGY

2.1 Carcinoma Cancer Detection Technology Pipeline:

Image processing may also be the product of doing such operations on an image, thus encouraging an improved image or removing any valuable knowledge from it. Image processing techniques are growing more complex and so the trend is to create as much automation as possible. At times, you'd wish to urge obviate distortions caused by lights and shadows during an image. Normalizing the RGB values of a picture can sometimes be an easy and effective way of achieving this. When normalizing the RGB values of a picture, each pixels value is split by the sum of the pixels value over all channels. So if we've a pixel with intensified R, G, and B within the respective channels, its normalized values are becoming to be R/S, G/S, and B/S (where, S=R+G+B). This pre-processing also important to hurry up the training and scaling techniques. The output of the image pre-processing technique may be a high resolution image which can be utilized in the further process. The figure 3 shows the procedure of carcinoma detection.

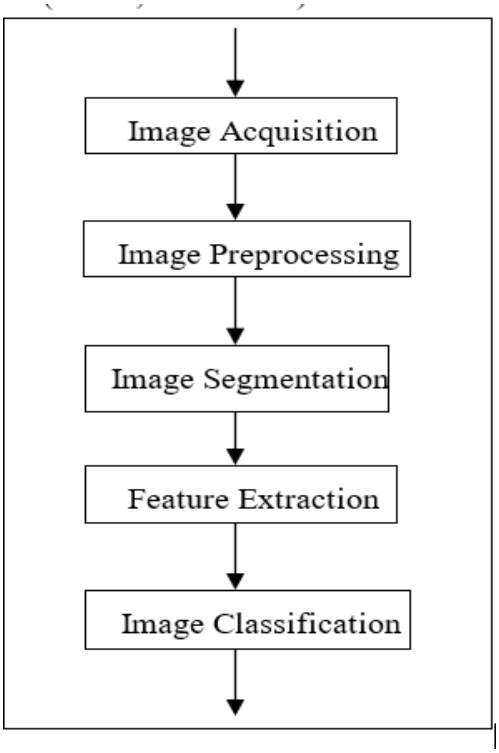

Fig 3: Melanoma Detection Technology[5]

2.2 Deep Leaning

Deep learning (also mentioned as deep structured learning or hierarchical learning) could even be a component of a broader family of machine learning methods supported artificial neural networks. Deep learning (also mentioned as deep structured learning or hierarchical learning) could even be a component of a broader family of machine learning methods supported artificial neural networks. Deep learning could even be a category of machine learning algorithms that uses multiple layers to progressively extract higher level features from the raw input. As an example, in image processing, lower layers may identify edges, while higher layers may identify the concepts relevant to an individual's like digits or letters or faces.

2.3 Convolutional Neural Network

A Convolutional Neural Network (CNN) is an algorithm in deep learning which contains a mixture of convolutional and pooling layers in sequence then followed by fully connected layers at absolutely the best as like multilayer neural network. CNN could even be a category of algorithm which is motivated to wish advantage of any 2d structure in data. Hence CNN is one of the favored algorithm for image classification. CNN also proves promising for task related to tongue processing. CNN leverages the local feature of an image

to understand higher accuracy for classification. CNN is one of the neural network which is simple to point out and has less number of hyper parameter as compare to ordinary fully connected neural network. The network will contains several convolutional networks mixed with nonlinear and pooling layers. When the image passes through one convolution layer, the output of the primary layer becomes the input for the second layer. And this happens with every further convolutional layer. The nonlinear layer is added after each convolution operation. It's an activation function, which brings nonlinear property. Without this property a network wouldn't be sufficiently intense and will not be able to model the response variable (as a category label).

The pooling layer follows the nonlinear layer. It works with width and height of the image and performs a down sampling operation on them. As a result the image volume is reduced. this means that if some features (as an example boundaries) have already been identified within the previous convolution operation, than an thorough image is not any more needed for further processing, and it's compressed to less detailed pictures.

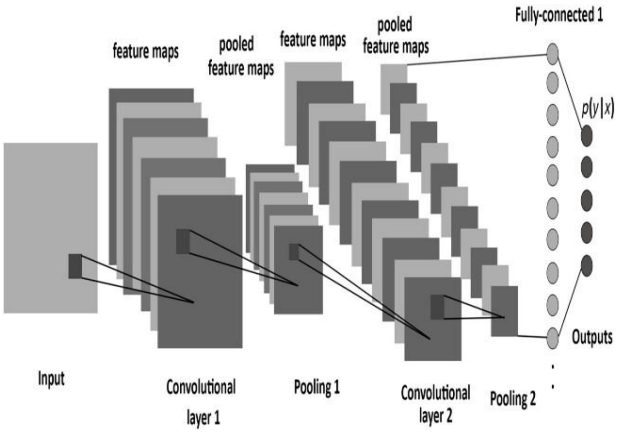

Fig 4: CNN Model

VGG16: It is a convolutional neural network model proposed by K. Simonyan and A. Zisserman from the University of Oxford within the paper "Very Deep Convolutional Networks for Large-Scale Image Recognition". The model achieves 82.7% top-5 test accuracy in Image Net, which can be a dataset of over 14 million images belonging to 1000 classes. [3]

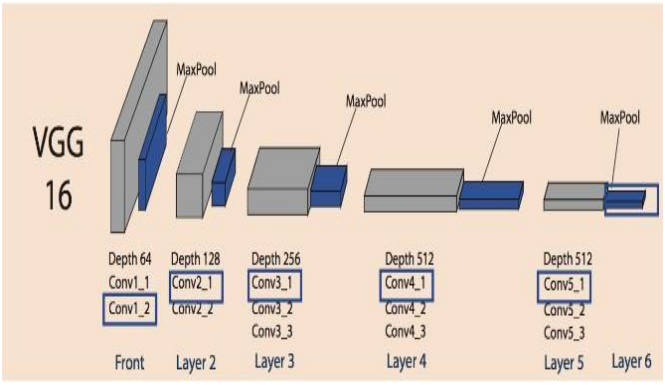

Fig 5: VVG16 CNN MODEL [3]

Activation layer is used for show how the neurons layers inside the model is connected. There are 1024 neuron layers are connected .ADAM optimizer is an adaptive learning rate optimization algorithm used for training deep nural networks which leverages the power of adaptive learning rates method to hunt out the individual learning rates of each parameter.

3. CONCLUSIONS

The diagnosis of skin cancer has been considered difficult because of the effects of insufficient diagnosis and excellent detection accuracy. The implications of artificial intelligent methods and the efficient use of soft computing skills will negate the problems of detection inaccuracy that the proposed CNN model was tested on various use cases and achieved better results in accuracy than other methods. Hence, our proposed model produced the best results.

Table 1: Performance Comparison

Name and Author	Accuracy	Conclusion	Future Work
Segmentation and Classification of Skin Cancer Melanoma from Skin Lesion Images-Nay Chi Lynn,Zin Mar Kyu	78.2%	This diagnosis work includes both segmentation with meanshift algorithm and classification using kNN.	To achieve more than 78.2% accuracy.

Detection of skin cancer melanoma through Computer vision-Wilson F.Cueva,F.Munoz, G.Vasquez,G.Delgado	97.51 %	Compared to doctor this system achieves highest efficiency.	Time taken to detect melanom a is very high.
Skin Cancer Detection and Classification-Pratik Dubal,Sankirtan Bhatt,Chaitanya Joglekar,Dr.Sonal i Patil.	76.9%	Neural network provide a sophisticated way to classify complex data with a high degree of accuracy.	The number of output classes can be increased as more data is available.
Computer Aided Detection of Skin Cancer-J.Abdul Jaleel,Sibi Saleem,Aswin R.B.	88%	It proves to be better diagnosis method than the conventional biopsy method.	By varying image processing techniques and ANN,the accuracy can be improved
Review on Automatic Early Skin Cancer Detection-Azadeh Noori Hoshyar,Adel Al-Jumaily.	92%	The automated skin Cancer system can be well designed as a substitute of clinician in melanoma diagnosis.	It is a time consuming process.
Research on Skin Cancer Cell Detection using Image Processing= Enakshi Jana, Dr.Ravi Subban, S,Saraswathi	94%	The different architectures of ANN and SVN for skin cancer image classification provides best accuracy	By using other techniques other types of ckin cancer can be classified

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