International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

Skin Cancer Prediction using Image Processing and Deep Learning

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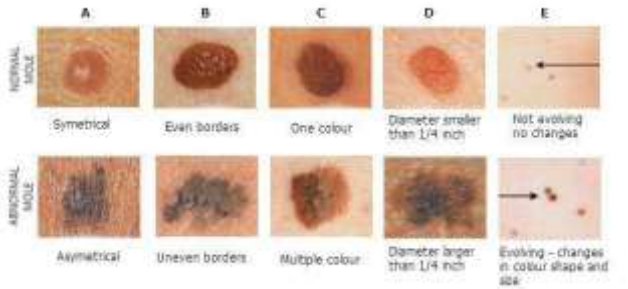
Abstract - Skin cancer is the most deadliest type of cancer which directly affects the skin of the patient. This deadly type of cancer is on the rise because of the ozone layer depletion. There is 50 percent rise in the cases of skin cancer all over the world. With the rise in the cases of skin cancer it is necessary to find the computer-aided solution instead of the manual method of analysing the patterns in the skin moles by the experts, which is very tedious and time consuming process. If machine learning and image processing are used in the solution, we can make this process quick and easy. To automate the process of skin cancer detection, this project aims to develop a deep convolutional neural network. As the transfer learning will not require heavy computational power to achieve the better performance. The deeper CNN models will give much better performance compared to shallower models.

1. INTRODUCTION

In the past 10-year amount, from 2008 to 2018, the annual variety of malignant melanoma cases has raised by 53 percent, partially thanks to raised ultraviolet exposure. Though malignant melanoma is one in all the foremost deadly varieties of carcinoma, a quick diagnosing will cause a really high likelihood of survival. The first step within the diagnosing of a malignant lesion by a skin doctor is visual examination of the suspicious skin space. An accurate diagnosing is vital, due to the similarities of some lesion types; moreover, the diagnostic accuracy correlates powerfully with the skilled expertise of the medico. While without any additional technical support, dermatologists have a 65-80 % accuracy rate in malignant melanoma diagnosing. In suspicious cases, the visual scrutiny is supplemented with dermoscopic pictures captured with a special high-resolution and magnifying camera.



Procedure to detect Skin Cancer

The combination of visual inspection and dermoscopic images ultimately results in an absolute melanoma detection accuracy of 75-84 percent by dermatologists.

CNN methods used to classify skin cancers are presented. A basic requirement for the successful training of deep CNN models is that sufficient training data labelled with the classes are available.

Skin Cancer Fundamentals

Skin cancer is nothing however the abnormal growth of skin cells — most frequently develops on skin exposed to the sun. however, this common type of cancer may occur on areas of your skin not normally exposed to daylight. There are 3 major varieties of carcinoma basal cell malignant neoplastic disease, epithelial cell malignant neoplastic disease and skin cancer. You'll scale back your risk of carcinoma by limiting or avoiding exposure to ultraviolet (UV) radiation. Observing the skin for dubious changes will facilitate discover carcinoma at its earliest stages. Early detection of carcinoma offers you the best likelihood for fortunate carcinoma treatment.

A. Melanoma

Melanoma, the foremost serious variety of carcinoma, develops within the cells (melanocytes) that manufacture animal pigment — the pigment that offers your skin its color. Malignant melanoma can even type in your eyes and, rarely, in internal organs, like your intestines. The precise reason for all melanomas is not clear, however exposure to ultraviolet (UV) radiation from daylight or tanning lamps and beds will increase your risk of developing malignant melanoma. Limiting your exposure to ultraviolet illumination radiation will facilitate scale back your risk of malignant melanoma.

B. Basal Cell Carcinoma

Basal cell malignant neoplastic disease could be a form of carcinoma. Basal cell malignant neoplastic disease begins within the basal cells — a sort of cell at intervals the skin that produces new skin cells as recent ones disappear. Basal cell malignant neoplastic disease usually seems as a rather clear bump on the skin, although it will take alternative forms. Basal cell malignant neoplastic disease

happens most frequently on area unit of the skin that are exposed to the sun, like your head and neck.

Fig 4: Skin Cancer Melanoma

C. Squamous Cell Carcinoma

Most of the stratum is formed from flat, scale-like cells known as squamous cells. Around 200 of skin cancers develop from these cells, and these cancers area unit known as epithelial cell cancers. Epithelial cell cancer is especially caused by sun exposure, therefore it's going to be diagnosed on several regions of the skin. It may develop on skin that has been burned, broken by chemicals, or exposed to x-rays. Epithelial cell cancer is usually found on the lips; at sites of a long-standing scar; and on the skin outside the mouth, anus, and a woman's canal. Two to five of epithelial cell cancers unfold to alternative elements of the body, that makes it lot of seemingly to unfold than basal cell cancer.

D. Merkel Cell Cancer

Merkel cell cancer could be a extremely aggressive, or fast-growing, rare cancer. It starts in hormone-producing cells simply beneath the skin and within the hair follicles. It's sometimes found within the head and neck region. Merkel cell cancer might also be known as system cancer of the skin or fibrous tissue cancer.

Literature Review

In Mishraa et al. the task is majorly divided into three parts which are lesion Segmentation, feature segmentation and classification.

Paper Name, Year	Methodology	Advantages	Drawbacks
An Overview of Melanoma Detection in Dermoscopy Images Using Image Processing and Machine Learning, 2016	The task is divided into 3 stages. 1. Lesion Segmentation 2. Feature Segmentation 3. Classification. Different methods for each stages are listed.	Pre-processing methods are very better	Data Limitation is big concern for training the models.
Melanoma Detection by Analysis of Clinical Images Using CNN, 2016	1. Illumination removal, Skin texture normalization. 2. K-means algorithm is used for edge detection. 3. For classification purpose, CNN is connected with fully connected layers where final diagnosis is done.	The feature extraction method is automated because of introduction of the CNN.	1. Because of the shallower neural networks used in the model cannot learn very effective distinctions. 2. Lack of the Data variety.
Automated Melanoma Recognition in Dermoscopy Images via Very Deep Residual Networks, 2016	1. In this paper, two NN models are used FCRN which is a CNN used for image processing. 2. DRN which is a Fully connected layer. 3. Both FCRN and DRN are residual networks with very deep neural networks.	1. Deeper neural networks allows the model to learn irrespective of the data limitations. 2. Use of residual networks eliminates the vanishing gradient problem.	1. Although deep neural networks give very good performance, they need lots of computational power to train networks.

Various methods of every stage is properly stated in this paper. Because of the data constraints algorithms like SVM, Bayesian Classifiers or other classification techniques are not very effective[1].

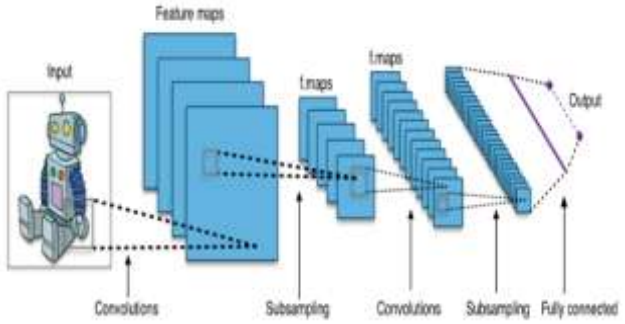


Fig 2: Convolutional Neural Network

In Nasr-Esfahani et al. published in 2016, convolutional neural network is used for classification due to which feature extraction is fully automated. Because of the shallower neural networks used in the model cannot learn very effective distinctions between malignant and benign skin mole[2]. In Lequan et al published in 2016, two NN models are used FCRN which is a convolutional network used for image processing and feature extraction and DRN which is a Fully connected neural network. Both of these layer are very deep in nature as they use ResNet architecture. Because of usage of the deeper neural networks, the model is able to learn irrespective of the data limitations but it need lots of computational power to train both of the models[3].

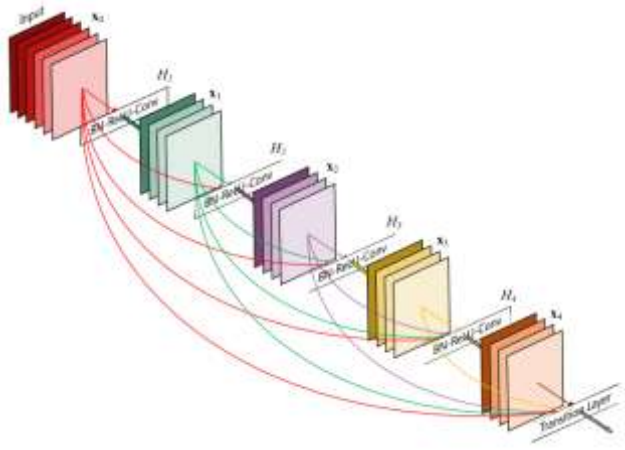


Fig 3: ResNet

In Lopez et al, it proposes to use the pretrained Convolutional networks models. The Fully connected layers is attached to the VGG16 model. This attached layers needs to be trained. Using pretrained models like VGG16 allows us to prepare the model without much need of computational power[4].

In Mendes et al. published in 2017, uses ResNet152 pretrained model to make the classifier. Because of the Data Augmentation, the model is trained on wide variety of features, which makes the model resistant to overfitting. In this paper, the author faces the need to test the model on wide variety of data with more diversity [5].

ACKNOWLEDGEMENT

We are profoundly grateful to Prof. S.P. Bholane for his expert guidance and continuous encouragement throughout to see that this project on "Skin Cancer Prediction Using Image Processing and Deep Learning" rights its target since its commencement to its completion .We are also extremely grateful to our respected H.O.D. Prof. M. P. Wankhade for providing us with all the facilities and every help for smooth progress of our project. We would also like to thank the committee staff of our group for timely help and inspiration for completion of this project. At last we would like to thank all the unseen authors of various articles on the Internet, helping us to become aware of the research currently ongoing in this field and all other staff of Department of Computer Engineering for providing help and support in our work.

Conclusion

In this paper, we have discussed various strategies for the identification and classification of skin cancer moles like convolutional neural network, transfer learning etc. We have also discussed the basic concept of skin canncer detection and various types of skin cancer.

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