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№ 4263

A Machine learning Framework for Eye Melanoma Detection Based on SVM and CNN Classification

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September 25, 2020

A Machine learning Framework for Eye Melanoma Detection Based on SVM and CNN Classification.

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Abstract*—Eye skin cancer could be a rare malady however consistent with malignancy; it's the foremost common kind of cancer. similar to alternative varieties of cancers, it's curable for many of the cases if diagnosed properly however the method of diagnosing is sort of difficult and is that the most problematic issue within the treatment of eye skin cancer. This paper presents an automatic eye skin cancer detection technique employing a convolution neural network (CNN) and support vector machine (SVM) with victimization grey scale conversion for top image resolution. Two hundred pre-diagnosed samples square measure taken from a customary info followed by pre-processing to lower resolution samples and eventually fed to the CNN design. Though the projected technique needs a large computation, a high accuracy rate of ninety four.59% is achieved outperforming the attention willcer} detection victimization support vector machine classifier for feature classification and have extraction can implement the convolution neural network to extract options from the image.

Keywords*—eye melanoma, pre-processing, support vector machine classifier, convolution neural network, gray scale conversation

I. INTRODUCTION

Eye Melanoma is one of the most deadly phases of cancer [1-2]. According to the National Cancer Institute (NCI), the young adult age group is the common symptoms of carcinoma, a form of eye melanoma. Though this form of cancer is a common cause of malignancy, ocular or eye melanoma is the rarest among all. 95% of cases there is a high chance of survival for patients if diagnosed at a very early stage of melanoma. But detection of this disease is just as difficult and rare as ocular melanoma is.

The melanomas present in the choroid, iris or ciliary body leads to this type of malignancy. The posterior choroid faces almost 85% of these cases. The iris, ciliary body and choroid anterior are directly related to the Anterior U veal melanoma. Studies reveal that almost 50% of patients who are diagnosed with U veal melanoma develop metastasis which makes this carcinoma a bleak malignancy even after treatment.

The manual process of diagnosis of u veal melanoma needs very well trained specialists of high observation skills. Thus the diagnosis suffers from the variance. Due to such issues in detection, recent advancements in researches have led it to the aid of artificial intelligence (AI) [3]. Artificial Intelligence can be demonstrated to perform robustly in prospective clinical settings, the results can be incorporated in the medical decision making related to this. Traditional AI- based tools have been used for detection and classification of lung cancer from tomography images [4]. Also breast cancer detection has been carried out in [5] based on image registration methods, where features from gray level co- occurrence matrix are fed to an convolution neural network (CNN). In [6], liver cancer classification is done using support vector machine (SVM) and ANN. Comparative results depict that SVM outperforms ANN. Ahmed ET al.[7] have presented an eye melanoma detection system using SVM and CNN taking image features into account and obtained an accuracy of 94.59%.

Convolution neural network (CNN) [8-9] is an extension of the ANN, motivated by the human nervous system. With proper training, the process improves its ability to detect the malignant lesion in eyes. CNN and SVM is used mainly to classify images and perform object identification within scenes. These features of CNN and SVM are very beneficial for the detection of ocular melanoma.

In recent researches, it has been observed that this kind of AI-based diagnosis processes is more effective. SVM and CNN has higher sensitivity and specificity than the manual detecting processes. With the helping aid of this, the dermatologists and ophthalmologists can diagnose faster and it may help in finding the malignancy at its early stage.

This paper reports a machine learning frame work using SVM and CNN for automated detection of eye melanoma. The main advantage of using CNN is that its training is quite simpler and possesses less parameter. Although the proposed method requires a huge computation,

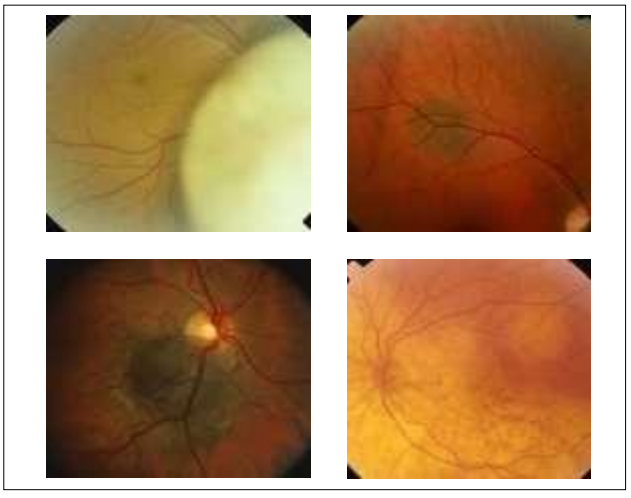

Fig. 1. Ocular images with choroid melanoma obtained from [10]

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Section II describes the entire work introducing image pre-processing using SVM classifier and CNN architecture. Results and discussion are given in section III .Conclusion is drawn in Section VI.

II. DETAILED DESCRIPTION OF THE WORK

The proposed work comprises a layered structure as that of traditional neural network. Here individual layer has its own functions for supervised training and the training is done by machine learning. The main contribution of machine learning compared to CNN and SVM or other machine learning tools is its capability to introduce newer features obtained from training data set. Images of eye melanoma have been taken from New York Eye Cancer Center database [10]. Each image is assessed and verified by medical experts that whether the images portray eye melanoma or not. These images build the input data set, followed by per-processing and finally fed to a SVM and CNN structure. Numerous features are learnt in the layers of the network taken from training data set and the features are classified into proper classes by the final layers as melanoma or non-melanoma images. The flowchart of the proposed scheme is depicted in Fig. 2. The proposed scheme requires process with separate feature extraction and classification for the eye melanoma detection. It presents the entire eye melanoma detection process, where per-processing, SVM and CNN architecture are discussed in subsequent sub-sections.

A. Input Image

The training data set are implemented as input image. The input images are taken in the format ".jpg" or ".png".

B. Pre processing

The collected images are subjected to preprocessing. In this step we can implement.

a) Image Resize: In this step, the input image is Resize into 256 X 256.

b) Gray Scale Conversion: In this step, the image is converted into gray scale format.

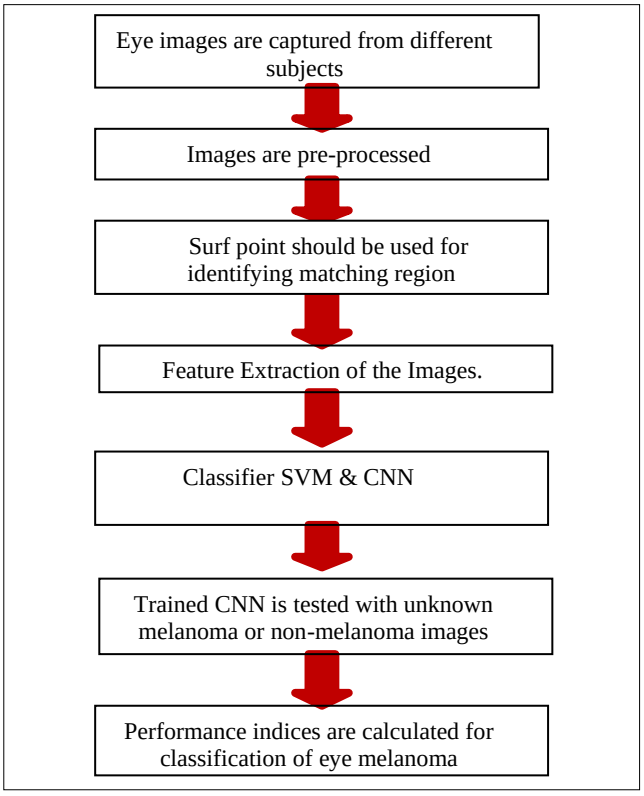

Fig. 2. Flowchart of the proposed system.

A. Feature Extraction: In the feature extraction process, we can implement the Mean, STD, Homogetiny and Convolution Neural Network to extract features from the image.

B. Feature Classification: In this step, the classification is done by using the Support Vector Machine classifier to classify the image.

II. EXPERIMENTAL RESULTS

The performance of the proposed method is evaluated on eye cancer dataset. 200 eye melanoma images with various modes have been used in this study. Each frame in the dataset is marked and labeled by medical experts as melanoma or non-melanoma using MATLAB under several image processing.

The performance indices *e.g.*, accuracy, specificity, sensitivity, TP, TN, FP, FN will be estimate by showing

TABLE I. CONFUSION MATRIX OF THE PROPOSED WORK

Results	***Truth***	
	Eye-melanoma	***Non-melanoma***
Eye-melanoma	60 (True Positive)	37 (False Positive)
Non-melanoma	40 (False Negative)	63 (True Negative)
Total	100	100

TABLE II PERFORMANCE COMPARISON WITH PREVIOUSWORK

Methods	*Accuracy*	*Specificity*	*Sensitivity*
Ahmed *et al.*[7]	85%	90%	80%
Proposed	91.76%	95%	90%

The main goal of this research is to address a non-invasive, easy and accurate method to detect eye melanoma automatically. In future, automated retina tumor detection and classification should be carried out using machine learning tools to treat the eyes carefully and enhance the chances of survival and CNN can be used for high accurate prediction on several stages and process with large datasets.

$$\text{Accuracy} = \frac{TP + TN}{TP + FN + FP + TN} = 94.59 \quad (3)$$

$$\text{Specificity} = \frac{TN}{TN + FP} = 95.00 \quad (4)$$

$$\text{Sensitivity} = \frac{TP}{TP + FN} = 100.00 \quad (5)$$

$$\text{PPV} = \frac{TP}{TP + FP} = 97.05 \quad (6)$$

$$\text{NPV} = \frac{TN}{TN + FN} = 83.82 \quad (7)$$

III. CONCLUSION

This paper reported a machine learning based method for automated diagnosis of eye melanoma using convolution neural network and SVM. Firstly, the ocular images are pre-processed by resizing to a constant resolution and secondly, the processed images are fed to the CNN and SVM classifier.

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