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Design and Implementation of CNN for detecting Melanoma through Image Processing

Shreya Ranjan[1], Sri Lakshmi Chundru[2], Vivek Kumar[3], Shwetha M[4], Dr. S. Mohan Kumar[5], Dr. Jitendranath Mungara[6], Prof. J.Karthiyayini[7]

[4]*Student, B.E, Information science and Engineering Department, NHCE, Bangalore, India*
[5]*Associate Professor, Information science and Engineering Department, NHCE, Bangalore, India*
[6]*Head of department, Information science and Engineering Department, NHCE, Bangalore, India*
[7]*Senior Assistant Professor, Information science and Engineering Department, NHCE, Bangalore, India*

Abstract*: *Melanoma is a type of skin cancer which is caused by prolonged exposure to u-v light. Early days melanoma detected through dermoscopy where doctor tries to recognize melanoma based on his experience and assumption. But many cases patient who suffers from melanoma dies because of it not detected early stages. In recent years, several procedures have been proposed to detect and analyze skin cancer. Early stages only skin cancer can be classified as malignant or benign. All proposed methods contribute better values of precision, sensitivity, specificity, and accuracy.

Keywords**: machine learning, SVM network, neural network, pre-processing, segmentation, feature extraction, melanoma classification, melanoma validation, test cases, CNN, histogram.

I. INTRODUCTION

Malignant melanoma considered as one of the most deadly form of skin cancer. In US one person dies of melanoma every 57 minutes. In Australia 128000 new cases of cancer detected in 2014. Traditionally, in the skin cancer diagnosis process, pathologists use histopathological images of biopsy samples removed from patients and examine them under a microscope. However, these judgments depend on their personal experiencing and often lead to considerable confusion .Hence in order to detect melanoma computational tools and learning techniques required. Essential use of learning techniques is to improve performance requires a proper choice of the learning algorithm and of their statistical validation. Computer aided skin cancer diagnostic based on histopathalogical images is a difficult task given the relative paucity of labelled lesion data and consequently the low quality of training data available. In human skin melonocytes are contains melanin which is responsible for skin colour. Melanoma can be malignant or benign type. Malignant Melanoma is a tumour consisting of spindle-shaped cells with an increased dermal connective tissue component. This form of rnalignant melanoma is almost impossible to diagnose. In order detect melanoma at early stages we can follow four processes namely acquiring of images, segmentation, feature extraction and classification. Acquiring of images can be done through medical datasets of standard size. Before segmentation pre-processing process also done which consists of rescaling, hair removal, glare removal, colour enhancement will be done. During segmentation images will be converted into gray scale which will be converted into binary values. Feature extraction can be done through ABCD (Asymmetry, Border, Colour, Dimensions) rules. Finally based on values obtained skin cancer classified into malign or benign.

II. LITERATURE SURVEY

Melanoma skin cancer is critical and dangerous for human beings. According to Dr. H.R. Mhaske Early detection of Melanoma skin cancer is very much necessary for the patient because this Melanoma skin cancer directly lead to the death of a person. If it is detected at early stage then Melanoma skin cancer is completely curable. Early detection and classification of Melanoma skin cancer is done using different classifiers as Neural Network and Support Vector Machine[1] by using CAD *et al*[27],[28],[29],[30],[31],[32],[33]. According to Wilson F. Cueva, In the last decades, skin cancer increased its incidence becoming a public health problem. Technological advances have allowed the development of applications that help the early detection of melanoma. In this context, an image processing was developed to obtain Asymmetry, Border, Color, and Diameter (ABCD of melanoma by applying CAD algorithm[34],[35],[36],[37],[38],[39]). Using neural networks to perform a classification of the different kinds of moles. As a result, this algorithm developed after an analysis of 200 images was obtained a performance of 97.51% [2]. Melanoma skin cancer is on the rise globally due to increased ultraviolet radiation. according to suleiman mustafaimage pre-processing, segmentation and feature are key stages for accuracy in classification of segmented skin lesions. he focused on the

use of colour space by experimenting with luminance to enhance the visualization for grab cut segmentation accuracy. he extracted geometric and corner features, that are used to train the SVM machine learning algorithm with promising results [3].

Aya Abu Ali proposed a method for classifying melanoma images into benign and malignant using Convolutional Neural Networks (CNNs).A regular convolutional network employing a modest number of parameters is used to detect melanoma images. Comparisons with the winning entry in the competition demonstrate that one can achieve a performance level comparable to state-of-the-art using standard convolutional neural network architectures that employ a lower number of parameters [4]. Automated melanoma recognition from dermoscopy images is one of the challenging task. First, the huge intra class variation of melanomas in terms of color, shape, size , textures and locations in the dermoscopy images as well as the high degree of visual similarity between melanoma and non-melanoma lesions make it difficult to discriminate melanomas from non-melanoma skin lesions. Here physicians are facing difficulty in discriminating the skin lesions. Second, the relatively low contrasts and uncertain boundaries between skin lesions (especially at their early stages) and normal skin regions make the automated recognition task more harder. Finally, the presence of artifacts, either natural (hairs, veins) or artificial (air bubbles, ruler marks etc.) may blur or obstruct the skin lesions and further becomes more serious situation to handle. A lot of efforts have been dedicated in solving this challenging problem. Early investigations are achieved to apply low-level hand-crafted features to distinguish melanomas from non-melanoma skin lesions, including, color [5],shape [6] and texture [7], [8]. Some of the researchers are undertaken to employ feature selection algorithms to select proper features and utilized combinations of these low-level features to improve the recognition performance [9], [10]. But these hand-crafted features are not able to deal with the huge intraclass variation of melanoma and the high degree of visual similarity between melanoma and non-melanoma lesions , and the artifacts existing in dermoscopy images, leading to unsatisfactory results. On the other hand, some researchers also proposed to perform segmentation first and then based on the segmentation results to recognize the melanomas [10]–[14]. The segmentation allows the feature extraction procedure to be conducted only on the lesion regions and thus generate more specific and representative features. The drawback of this methods, both the segmentation and classification procedures are still based on low-level features with limited discrimination capability. Recently, convolutional neural networks (CNNs) with hierarchical feature learning capability have led to breakthroughs in many medical image analysis tasks, including classification [12], [13], detection [14]–[15] and segmentation [16], [17]. Some researchers started to employ CNNs for classifying the melanoma and aiming to take the advantage of their discrimination capability to achieve performance gains. Codella et al. said that to integrate CNNs(convolutional neural network), sparse coding and support vector machine (SVM[40],[41],[42],[43],[44]) for melanoma recognition [18]. Next Kawahara et al. presented a fully convolutional neural network based on AlexNet 19] to extract representative features of melanoma [20]. But these methods either just depend on the features trained from natural image dataset (such as ImageNet [21]) without sufficiently considering the characteristics of melanoma or utilize CNNs with quite shallow architecture. They are not able to deal with the challenges of melanoma recognition properly. There are much more researches has to be done to tap the potentials of CNNs to further improve the accuracy of melanoma recognition. Many theoretical investigations [22], [23] and practical studies [24], [25] have demonstrated that the network depth is a major factor of model expressiveness. The discrimination capability of features learned from CNNs can be enriched by increasing the number of stacked layers (network depth). The performance gain of very deep networks in natural image processing tasks has been exploited by recent works [24]–[26].

III. PROBLEM STATEMENT

The goal of the reviews is to determine the good performance techniques to recognize the early skin cancer through image processing techniques. The result mainly concerned about pre-processing, segmentation, feature extraction, classification. The final objective is to obtain the methods which are having accuracy level is high.

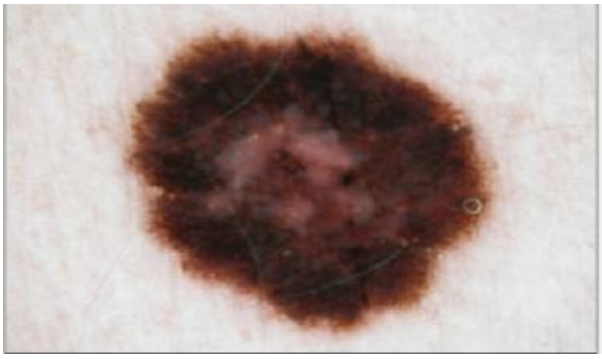


Figure 1: Original Image

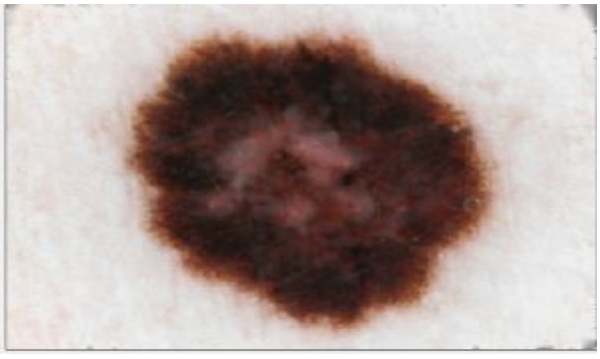


Figure 2: Filtered Image

Above figure 1 is median filtered original image(RGB) which is converted into filtered image by applying shading corrected , hair removal and glare removal techniques.

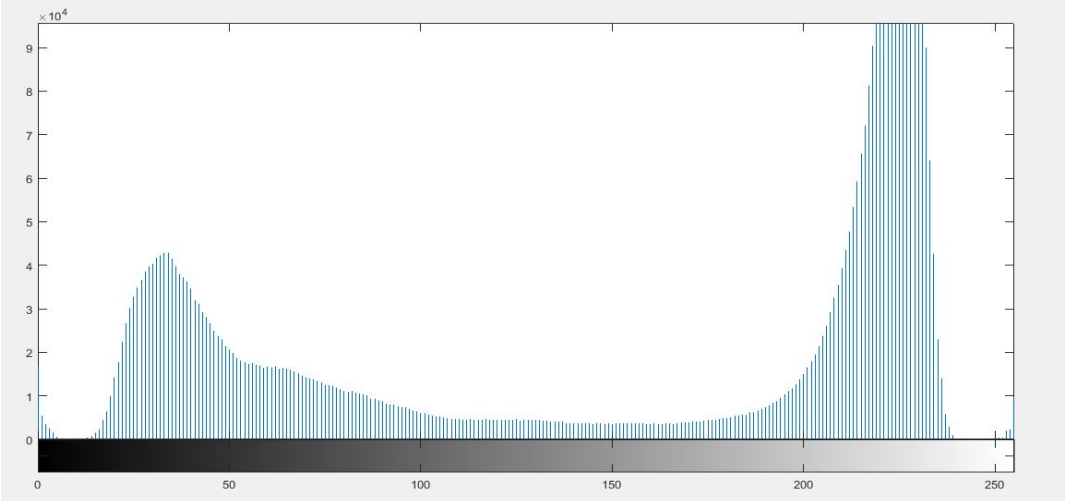


Figure (a): Applying Histogram on Original image.

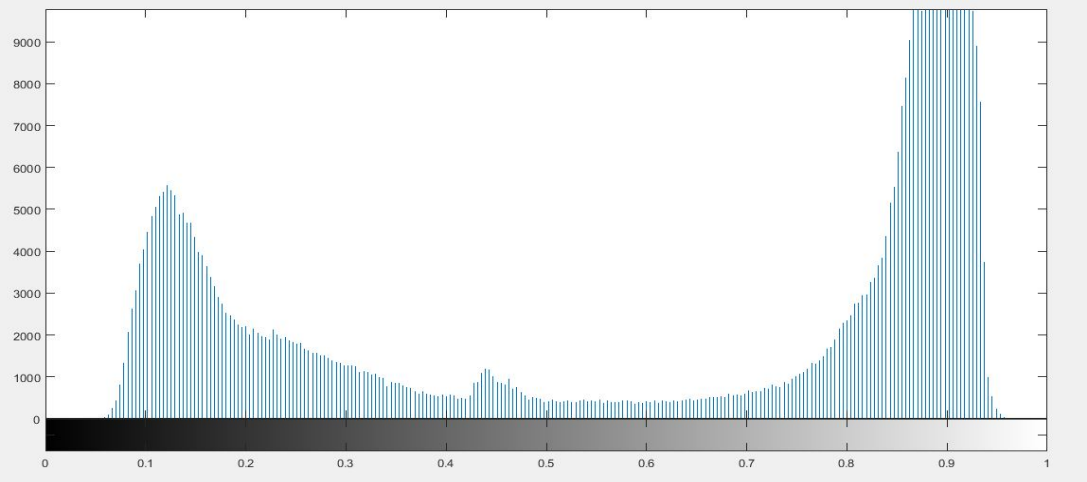
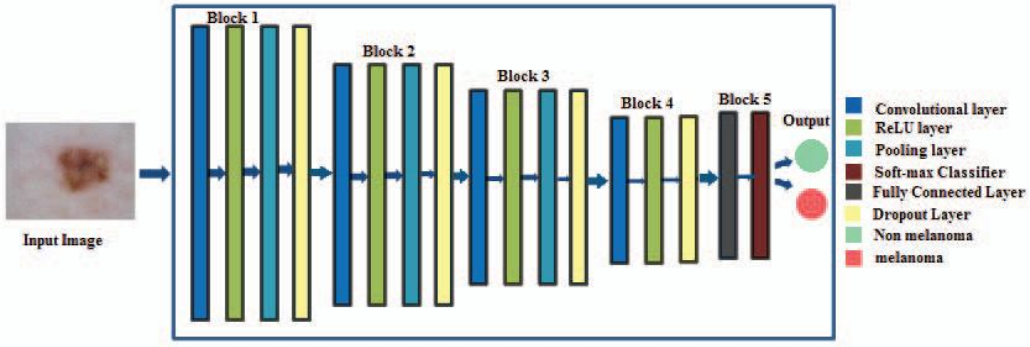


Figure (b): Applying Histogram on Filtered image.

IV. METHADOLOGY



Figure(c)[1]: Proposed Convolutional Neural Network Architecture.

From the above diagram we come to know that the input image will cross across different layers (such as convolutional, ReLU, Pooling, Soft-max, Fully connected, Dropout) and at last the output will be classified as melanoma and non melanoma.

V. CONCLUSIONS

From this paper we come to know that many researches took place to classify and detect melanoma skin lesion. Here we come to know that SVM classifier accuracy is improved compared to the other algorithm. By using CNN our result are comparable to state-of-the-art results while using a significantly lower number of parameters. In future work more technologies required to increase the efficiency of CNNs to enhance the accuracy of melanoma detection

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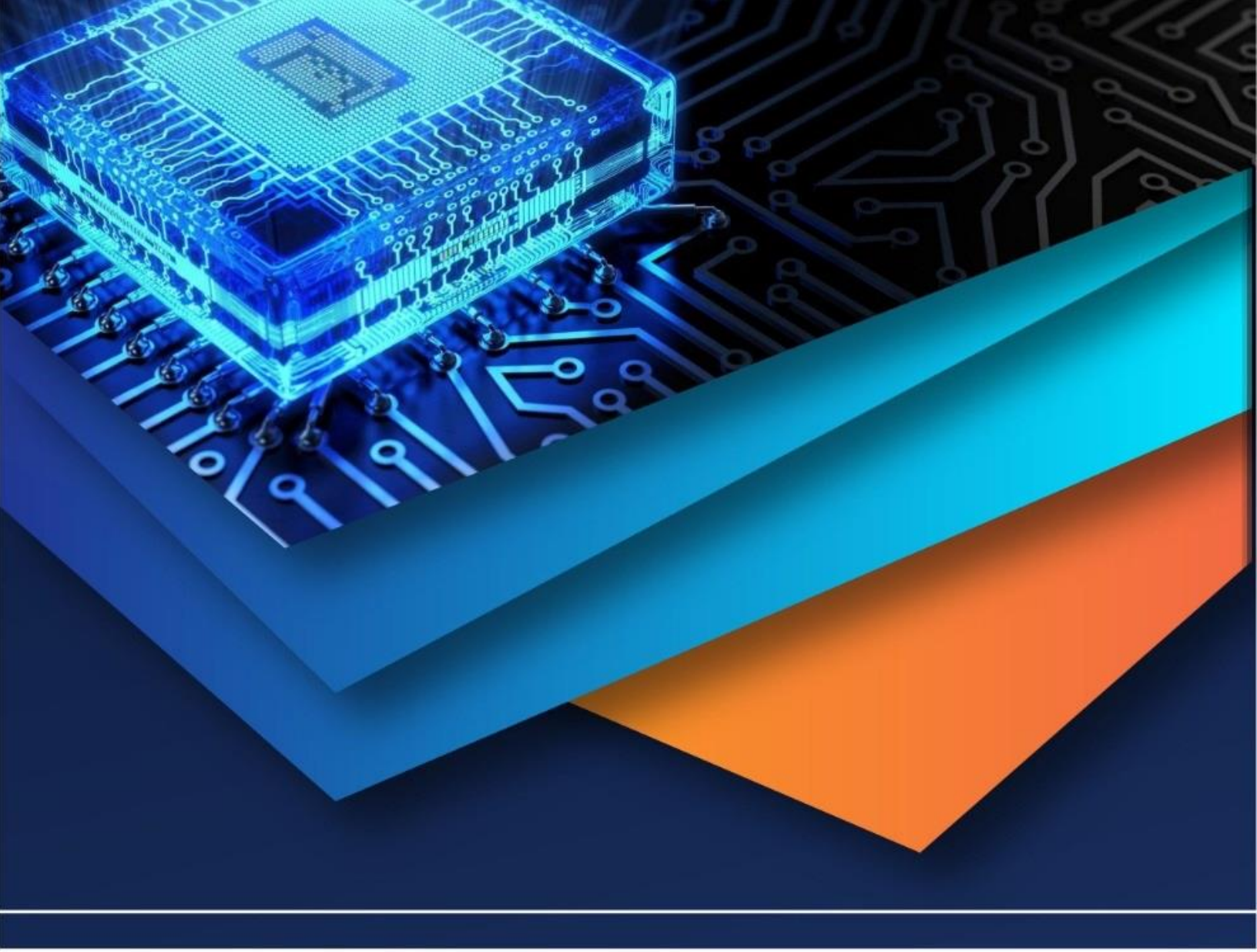

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