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Skin Cancer Detection and Classification based on Machine Learning

R. Priyadarshini[1]

Arunai Engineering College, Thiruvannamalai, Tamil Nadu, India[1]

ABSTRACT: In the present current world, skin cancer is the most widely recognized reason for death among people. Skin cancer is irregular development of skin cells frequently creates on body exposed to the sunlight, yet can occur in any part of the body. An early and quick identification of malignant growth can save the patient's life. In this paper we proposed skin cancer detection using k-NN for early detection of skin cancer. The dermoscopy image of skin cancer is taken and it goes under different pre-processing technique for noise removal and image enhancement. Then the image undergoes to segmentation using Fuzzy C mean method. Feature of image is extracted using DWT methodology and the features are given as input to classifier. k-Nearest Neighbor is used for classification. The simulation result shows better performance in term of High-dimensionality, versatility and time consumption.

KEYWORDS: kNN, DWT, skin cancer, Dermoscopy**.**

I.INTRODUCTION

Skin cancer is one of the most frequent types of cancer. With 5 million cases reported annually in the United States, it is the most widespread type of cancer [1]. Skin has three essential layers. Skin cancer growth starts in the outermost layer, which is comprised of first layer squamous cells, second layer basal cells, deepest or third layer melanocytes cell. Non-melanoma skin malignancy reacts to treatment and once in a while spreads to other skin tissues. Melanoma is more risker than most other types of skin cancer [2]. If it is not identified at the initial stage, it is rapidly attack close by tissues and spread to other parts of the body. Biopsy method is time consuming for patient and lot of time for testing. Biopsy is done by removing skin tissues and that sample undergoes series of laboratory testing [3].For skin lesion assessment by experts, dermoscopy has been established as an imaging modality that improves diagnostic performance compared to unaided visual examination [4]. Typically, experts rely on subjective evaluation of skin lesion features. For more systematic diagnosis procedures, rule sets, such as the "7-point checklist" have been proposed to interobserver variability [5]. Furthermore, computer aided diagnosis (CAD) systems have been proposed that also promise to reduce interobserver variability and address the limited availability of trained experts [6]. Earlier approaches relied on extraction of handcrafted features to be fed into conventional classifiers [7]. A group of methods combines the identification of dermoscopic criteria with a broad analysis of the lesion, taking into the account to degree of asymmetry, border sharpness, lesion architecture and color distribution [8]. C.Nagarajan *et al.*[4] [proposed straightforward extension to classic feature extraction is to use deep learning for feature extraction with conventional machine learning methods for skin lesion classification . More recent approaches moved to end-to-end trainable convolutional neural networks (CNNs)for lesion diagnosis [10].

Two of the major limitations of dermoscopy are the subjectivity and requirement of extensive training [11]. Image pre-processing is a required step to deal with images that do not sufficient to be analyzed. C.Nagarajan *et al.*[16] proposed dermoscopy images may be acquired using different devices and illumination conditions and rendering unreliable color information . Image enhancement is a popular technique to improve the performance if segmentation methods. The primary goal is to increase the contrast between the border of the lesion and the surrounding skin [13]. An accurate segmentation is important for the extraction of informative features, even though the relationship between the accuracies of segmentation and feature extraction has not been established [14]. In addition, multi-modal approaches using clinical images, dermoscopy and metadata have been proposed [15].A method where segmentation and lesion structure information is incorporated into the system [16]. The dataset consists of dermoscopic images that can serve as a benchmark for skin lesion diagnosis. HAM was used as a training set for the ISIC 2018 Skin Lesion Diagnosis Challenge where are presented the best approach based on publicly available data [17].

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Among the fuzzy clustering methods, fuzzy c-means algorithm is the most popular method used in image segmentation because it has robust characteristics for ambiguity and can retain much more information than hard segmentation methods [18]. k-Nearest Neighbors (kNN) is one of the simplest algorithms used in Machine Learning for regression and classification problem. Classification is done by majority vote to its neighbors. This technique is used for easily detect the skin cancer at early stage. The data is assigned to the class which has the nearest neighbors. As you increase the number of nearest neighbors, the value of k, accuracy might increase.

II. PROPOSED FRAMEWORK

Skin cancer detection using k-NN is defined as the process of detecting the specified area is affected or unaffected. Skin cancer is implemented by using Discrete Wavelet Transform (DWT) and k-Nearest Neighbor (k-NN). Discrete Wavelet Transform (DWT) is used for feature extraction and that image is used input image for classification.k-NN is machine learning technique, mainly used for the classification analysis and it delivers a unique solution.

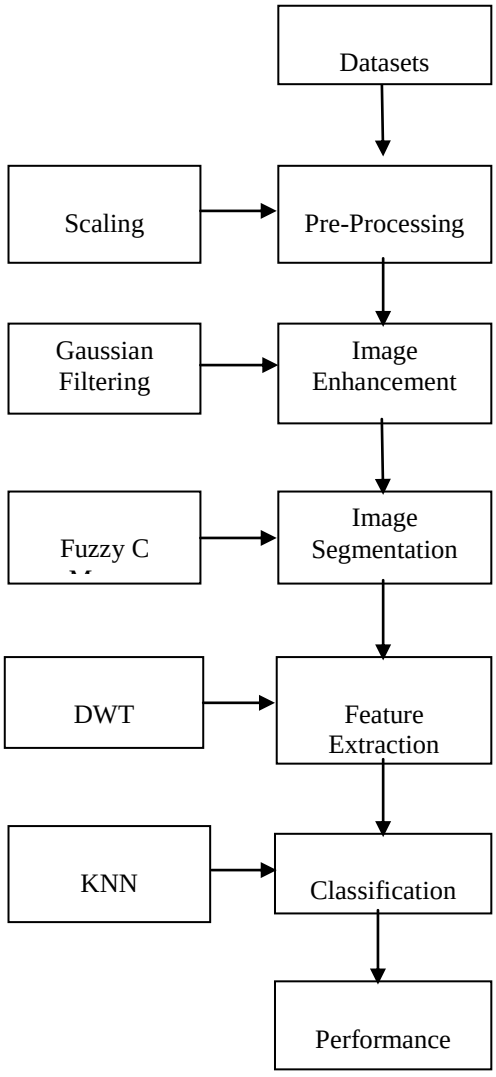

Figure 1: Block Diagram

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III. IMPLEMENTATION DETAILS

Input image
Input to proposed system is dermoscopic images taken by dermatoscope. It is a kind of magnifier to take pictures of skin lesions in body parts. This instrument is very easier to diagnose skin cancer.

Pre-processing
Then the pre-processing is carried out to improve the image data that reduce unwanted distortions and enhances some image features important for further image processing. Image pre-processing involves three main things 1) Gray scale conversion 2) Noise removal 3) Image enhancement.

Grayscale Conversion
The grayscale conversion is processed grayscale image contains only brightness information. Each pixel value in grayscale image corresponds to an amount or quantity of light. In gray scale conversion color image is converted into grayscale image shows in fig (3). Grayscale images are easier and faster than colored images.

Classifier
Then the classification is used to classify the image is affected or unaffected. k-NN classifier is used here. It takes the image and predict for each input image belongs to the detected area is affected or unaffected. The purpose of the k-NN is delivers a unique solution and the simplest algorithms in machine learning for regression and classification problem.
In our proposed system k-NN classifier takes training data, testing data and grouping all information then classifies the given input image is affected or unaffected shown in fig (5).

IV. SIMULATION RESULTS

The simulation of our proposed work is to detect and classify the skin cancer image. I have taken the digital images of skin cancer and they were undergone various pre-processing techniques like gray scale conversion, Gaussian Filtering,DWT method. All features are given to kNN to classify image is affected or unaffected. If the result is 1, the given image is ‘Affected’ and the result is 2, the given image is ‘Unaffected’.The output of the input image would be ‘Affected’ shown in fig (5).

Figure 2: Input image

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Figure 3: Grayscale image

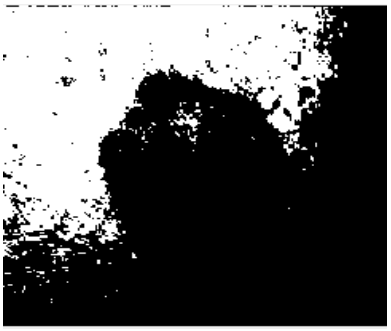

Figure 4: Segmented image

V. CONCLUSION

In this paper, the proposed system of skin cancer detection and classification can be identified and solutions are provided. Skin lesion image are taken by dermoscopy and then goes under pre-processing techniques for noise removal, gray scale conversion and image enhancement. By using Fuzzy C Mean for image segmentation and k-Nearest Neighbor algorithm is used to detect and classify easily whether the image is affected or unaffected. By using k-Nearest Neighbor (k-NN) algorithm, it gives more accuracy than Ada-boost classifier. It is more advantageous to patients.The proposed work provides better performance in terms of high-dimensionality, versatility and time consumption.

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