Analysis of Skin Cancer Classification Using GLCM Based On Feature Extraction in Artificial Neural Network

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ABSTRACT:
Skin cancer is the deadliest form of cancers in humans. Skin cancer is commonly known as Melanoma. Skin Cancers are of two types- Benign and Malignant Melanoma. Melanoma can be cured completely if it is detected early. Both benign and malignant melanoma appear in similar. So it is difficult to differentiate both. This is a main problem with the early skin cancer detection. Only an expert dermatologist can classify which one is benign and which one is malignant. The proposed scheme is using Wavelet Transformation for image improvement, denoising and Histogram Analysis and Proposed using classifies the type of approach for Skin Cancer using Artificial Neural Network (ANN) in approach for Skin Cancer. The extraction of texture features in the detected tumor has been achieved by using Gray Level Co-occurrence Matrix (GLCM). These features are given as the input to the Artificial Neural Network, Co-occurrence Matrix, and Back Propagation Network Classifier. It classifies the given data set into cancerous or non-cancerous.

INTRODUCTION:
Skin is the outermost covering of human body. It is a protective layer of the body which acts as first line of defense against foreign particles entering into the body. There are many diseases or conditions that affect the skin, one such abnormality occurring in skin is skin cancer. Normal cells grow in a controlled way such that new cells replace the old ones. But in the case of cancer, they grow in an abnormal way. Normal cells become cancerous due to the genetic disorders occurring in the nucleus of the cells by external or internal factors Skin cancer at its early stages can be cured. But when it is not recognized at its early stages, it begins to spread to other parts of the body and can be deadly.

Skin cancer is collectively called as Melanoma. Melanoma is named after the cell from which it presumably arises, the melanocyte. It is the skin cell producing the melanin pigment, which provides protective shielding from Ultraviolet radiations. Melanoma is of two types: Benign Melanoma and Malignant Melanoma. Benign Melanoma is simply appearance of moles on skin. A normal mole is usually an evenly colored brown, tan, or black spot on the skin. It can be either flat or raised. It can be round or oval. Moles are generally less than 6millimetres. Malignant melanoma is the appearance of sores that cause bleeding. Malignant Melanoma is the deadliest from of all skin cancers. It arises from cancerous growth in pigmented skin lesion. If diagnosed at the right time, this disease is curable. But one of the main problems associated with skin cancer detection is the similarity in appearance of Benign and Malignant Melanomas at its early stages. Malignant melanoma starts as a small mole. Most people ignores it by thinking that, it is just a mole. But if it is unchecked, it starts spreading to the other parts of the body and become fatal. So an early detection is of utmost importance in the treatment of melanoma.
AUTOMATED EARLY SKIN CANCER DETECTION SYSTEM:

STEP 1: The skin cancer detection system is the input image.

STEP 2: The noise removal. The noises are removed by filtering. Filtering method implemented here is the Median Filtering. STEP 3: The image after filtering is subjected to segmentation. In this segmentation process used to separate the skin cancer image.

STEP 4: The feature extraction used here is 2D Wavelet Transform.

STEP 4: The selected features are given as the input to Artificial Neural Network Classifier (ANN). The classifier classifies the given datasets into cancerous and non-cancerous. Figure 1 shows block diagram representation.

PROPOSED SYSTEM:

The methodology carried out in the proposed work is artificial neural network technique. This technique we can use more than one input check the problem. We used feed forward A single stage feed forward neural network classifier containing one input, one hidden and one output layer was predominantly used for lesion classification and sensitivities between 80-90% were reported. The extraction of texture features in the detected cancer has been achieved by using Gray Level Co-occurrence Matrix (GLCM). These features are given as the input to the Artificial Neural Network, Co-occurrence Matrix, and Back Propagation Network Classifier.

OBJECTIVES:

1. The first stage skin cancer input image.
2. The next stage image segmentation.
3. Improve the quality using the scope and accuracy of feature extraction techniques.
4. Create a comprehensive library of features that can be used to summarize the image.
5. The extraction of texture features used to Gray Level Co-occurrence Matrix (GLCM).
5. The last step used to identify the early stage skin cancer or ending stage of skin cancer.
GRAY LEVEL CO-OCCURRENCE:
The gray level co-occurrence matrix (GLCM) are extracted from each image. Co-occurrence matrices are calculated for four directions: 0º, 45º, 90º and 135º degrees. The seven Haralick texture descriptors are extracted from each co-occurrence matrices which are computed in each of four angles.

1. Angular Second Moment (ASM) 
   \[ f_1 = \sum_{i,j=0}^{N-1} p(i,j)^2 \]
2. Contrast 
   \[ f_2 = \sum_{i,j=0}^{N-1} (i-j)^2 p(i,j) \]
3. Inverse Difference Moment (IDM) 
   \[ f_3 = \sum_{i,j=0}^{N-1} \frac{1}{1+(i-j)^2} p(i,j) \]
4. Dissimilarity 
   \[ f_4 = \sum_{i,j=0}^{N-1} \frac{|i-j|}{N} p(i,j) \]
5. Entropy 
   \[ f_5 = -\sum_{i,j=0}^{N-1} p(i,j) \log_2 p(i,j) \]
6. Maximum Probability 
   \[ f_6 = \max_{i,j} p(i,j) \]
7. Inverse 
   \[ f_7 = \sum_{i,j=0}^{N-1} \frac{1}{i-j} p(i,j) \]

Classification Using ANNs
1. Back propagation network (BPNs) is used to classify the images.
2. The neural network used to hidden layer, input layer, output layer.

**ARTIFICIAL NEURAL NETWORK (ANN):**
An artificial neural network (ANN), generally called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network contains of an interconnected group of artificial neurons (processing element), working in unison to solve specific problems. ANNs, like people, learn by example. The neuron has two modes of operations. The training/learning mode and the using/testing mode. In mainly cases an ANN is an adaptive system that converts its structure based on external or internal information that flows through the network in the learning phase. Recent neural networks are non-linear statistical data modeling tools. They are generally used to model complex relationships between inputs and outputs or to find patterns in data.

**Structure and functioning of single neuron**
Back Propagation learning algorithm is a supervised learning algorithm. It is one of the most important developments in neural networks. This learning algorithm is applied to multilayer feed-forward networks consisting of processing elements (neurons) with continuous differentiable activation functions (Tan-sigmoid and log-sigmoid). The networks associated with back-propagation learning algorithm are also called back-propagation learning networks (BPNs). For a given set of training input-output pair, this algorithm provides a procedure for changing the weights in a BPN to classify an input correctly. The concept for this weight update algorithm is basically the gradient-descent method as used in case of simple perceptron networks with differentiable units. This is a way where the error is propagated back to hidden unit. The aim of the neural network is to train the net to achieve a balance between the net’s ability to respond (memorization) and its ability to give reasonable responses to the input that is similar but not identical to one of that is used in training (generalization).

**SIMULATION RESULT:**

**A) SKIN CANCER**

![Input Image](image1)

![Final Segmentation image](image2)

![Cluster Analysis](image3)

![Neural Network Training System](image4)

![Output](image5)

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Contrast | 75  
Correlation | 93  
Cluster Prominence | 247390

Table 1: Accuracy of Skin Cancer

B) NON SKIN CANCER

![Input Image](image)

Fig 9: Input Image

![Final Segmentation Image](image)

Fig 10: Segmentation

![Cluster Analysis Image](image)

Fig 10: Cluster Analysis

![Neural Network Training System](image)

Fig 11: Neural Network Training System

![Output](image)

Fig 12: Output

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B) Table 2: Accuracy of Skin Cancer

ADVANTAGE OF PROPOSED SYSTEM

The results of the artificial neural network techniques were promising as, we got 100% for sensitivity, 95% for specificity, and 97.5% for
accuracy. We can use more than one input check the problem.

CONCLUSION:

This paper presented an algorithm to improve the diagnoses of melanoma by the use of image processing and machine vision. The existing system consists of preprocessing, image segmentation, feature extraction and classification. We include Co-occurrence Matrix, Artificial Neural Network and Back Propagation Network. The results showed 95 percent accuracy. So we can easily identify cancerous and non-cancerous.

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REFERENCE


