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# On Feature Image Recognition of Melanoma using Nanotechnology Applications

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**Keywords:** dermoscopy, ABCD rule, segmentation, feature extraction, classification.

**ABSTRACT.** Melanoma is a form of skin cancer and has cancer of Nanotechnology has the potential to improve both the diagnosis and treatment of this disease. Combining nanoparticles with the biological and chemical therapies has immense scope and potential. Dermatologists use the ABCD rule to characterize skin lesions. Image analysis including image acquisition, hair detection, the segmentation methods are thresholding, edge-based, region-based on color images with computerized image analysis. It is the total number of pixels in the largest diameter by a millimeter (mm). It has four parameters classification on ANN for the recognition of malignant melanoma. They have been compared with the results classification obtained by ANN. There is implemented in MATLAB used the dataset which that they consider of 100 dermoscopic images from Hospital Kovai Medical. They have been achieved results shows an acceptable effect rates, an accuracy 95.32%, sensitivity 75% and specificity 96.28%.

**Introduction.** Melanoma, originated from melanocytes, is the most dangerous type of skin cancer. Although melanoma represents only a very little portion of skin, it accounts for the vast majority of skin cancer deaths [1] Siegel.et.al. An early stage melanoma can be surgically removed, with a survival rate of 99%. However, metastasized melanoma is difficult to cure. Metastasized melanoma is currently treated by chemotherapy, immunotherapy, radiotherapy and targeted therapy. Nanotechnology has been extensively studied for melanoma treatment and diagnosis, to decrease drug resistance, increase therapeutic efficiency and reduce side effects. we summarize the recent progress on the development of various nanoparticles for melanoma treatment and diagnosis. Several common nanoparticles, including liposome, polymersomes, dendrimers, carbon-based nanoparticles and human albumin, have been used to deliver chemotherapeutic agents and small interfering ribonucleic acids (siRNAs) against signaling molecules have also been tested for the treatment of melanoma. Indeed, several nanoparticle-delivered drugs have been approved by the US Food and Drug Administration and are currently in clinical trials. The application of nanoparticles could produce side effects, which will need to be reduced so that nanoparticle-delivered drugs can be safely applied in the clinical settings

## Nanoparticles in Melonoma Treatment

Nanoparticles can be designed to have multiple functions, such as targeting to cancer cells and producing image contrast. Many nanoparticles have been studied for the treatment of melanoma, including liposomes, polymersomes, and inorganic nano particles. Liposome is a sphere consisting of a lipid bilayer that contains aqueous core for hydrophilic drugs. Hydrophobic drugs can be contained between the two layers. Liposome is prepared by sonicating a lipid, with a process involving emulsification. Homogeneous nanosized liposomes can be achieved by filtering through a 0.2  $\mu\text{M}$  membrane. Furthermore specific ligands against tumor antigens can be attached to the liposome surface so that the nanoparticles can target cancer cells specifically. [2] Liposomes have been used to carry chemotherapeutic drugs, immunocytokines and siRNA, to increase treatment efficacy for melanoma. Similar structural nanoparticles have been designed, such as the cubosome and niosome, which consist of lipids. Polymersomes are composed of amphiphilic block copolymers, such as polylactic acid and poly ( $\epsilon$ -caprolactone), formulated to become nanoparticles. Polymersomes can encapsulate either hydrophilic or hydrophobic drugs. They are more stable and less permeable to small water-soluble molecules than are liposomes. Their surface can also be attached with ligands for targeting cells and controllable release. [3] Polymersomes have been used to deliver Dox for treating melanoma and demonstrated to be preferentially taken up by melanoma cells. The nanoparticles markedly reduced tumor growth in a melanoma xenograft model. Inorganic nanoparticles made from materials such as silica and aluminum have also been applied in melanoma therapy[4]. Silica can be made multiporous (which is then called mesoporous silica) to carry more drugs than as a simple sphere. A layered double hydroxide nanoparticle is made by layering a hydroxyl (-OH) group on inorganic materials, to carry drugs. This has been shown to increase immune response to a deoxyribonucleic acid (DNA) vaccine in a melanoma mouse model the capability of layered double hydroxide to carry enough small molecular drug is still a major problem.

## Methodology

**Clinical diagnosis.** One of the widely used methods by dermatologists to classify The cancerous skin melanoma from normal skin is the ABCD rule[5]. It is proved that it can be easily learned a reliable method providing. A more objective and reproducible diagnosis of melanoma Asymmetry-one half unlike the other half. Border irregular--scalloped or poorly circumscribed border. Color varied from one area to another; shades of tan and brown; black; sometimes white, red or blue. Diameter larger than 6mm as a rule (diameter of a pencil eraser) Shown in Fig. 1

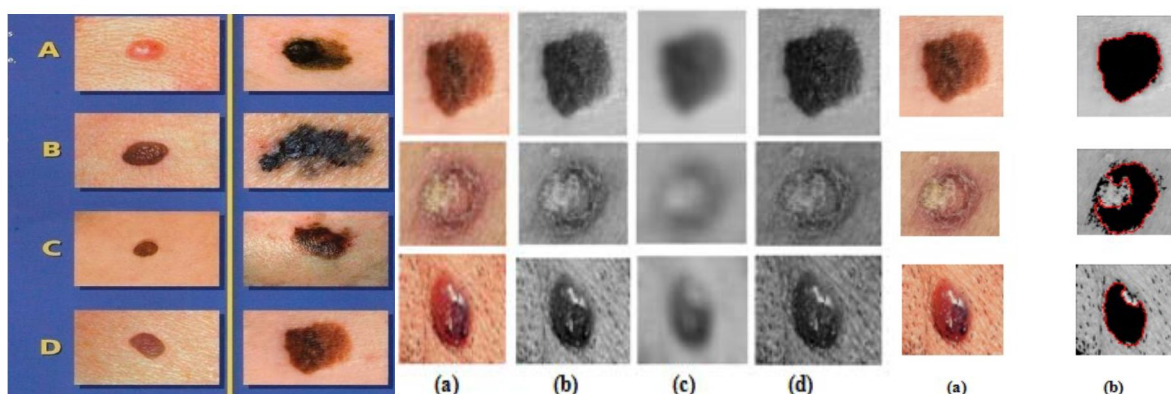
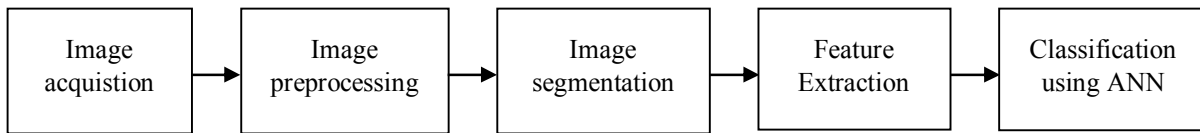


Fig. 1. ABCD rule of dermoscopy, Fig. 2 (a) Original image (b) Gray scale image (c) Filtered image (d) Contrast enhanced image Fig. 3 (a) Original image (b) Segmented image.

## Skin cancer detection methods



**Image Acquisition.** The first stage of our automated skin lesion analysis system is image acquisition. This stage is essential for the rest of the system. hence, if the image is not acquired satisfactorily, then the remaining components of the system may not be achievable, or the results will not be reasonable, even with the aid of some form of image enhancement. In order to capture high quality images, the iPhone 5S camera is used, equipped with 8 megapixels and 1.5 pixels

**Image Preprocessing.** Images are often corrupted by impulse noise due to transmission errors, The goal of noise removal is to suppress the noise while preserving image details. A variety of techniques have been proposed to remove impulse noise. Noise is perturbations of the pixel values.. Filters are used to suppress noise, enhance contrast, find edges and locate features. To enhance the quality of images, we can use various filtering techniques which are available in image processing. There are various filters which can remove the noise from images and preserve image details and enhance the quality of image. The common noise which contains the image is impulse noise. The impulse noise is salt and pepper noise (image having the random black and white dots). Medianfilter is the filter that removes most of the noise in image and grey scale image into contrast enhanced image shown Fig. 2.

**Image Segmentation.** In segmentation methods are Edge based, region based, thresholding. Edge carries a lot of information about the various regions in an image. They provide an outline of the object. An edge is said to be a set of connected pixels that lies on the boundary between two regions that differ in grey value. These pixels on the edge are called edge points. In Fig. 3 Edge points are shown clearly [6]. Edge detection technique is boundary identification where the information of the edge is detected and edge pixels with adjacent neighbour connectivity are tracked. Edge detection technique is a structural technique of the image segmentation process An edge detection operation is basically an operation to perceive important local changes in the intensity level of an image. The variation in intensity level is measured by gradient of the image. Major approaches of segmentation are based on the pixel values [7]. Thresholding technique is based on image space regions i.e. on characteristics of image. It converts a multilevel image into a binary image. In this approach a threshold is applied to the image in order to distinguish the regions in distinct intensities Thresholding technique is used to determine an intensity value called as threshold and then threshold splits the desired classes. The segmentation is done by grouping pixels with intensity greater than the threshold into one class and all other pixels into another class. A region of an image is defined as a connected homogenous subset of the image with respect to some criterion such as gray level or texture. The regions in an image are defined as group of connected pixels with similar properties. In this approach, every pixel is allotted to a particular object or region. On Comparing with edge detection method, segmentation algorithms are relatively simple and more immune to noise. Edge based method partition an image on the basis rapid change in intensity near edges whereas region based methods, partition an image regions that are similar according to some predefined criteria. In the region-based segmentation, pixels which are corresponds to a particular object are grouped together and marked. Region-based segmentation uses appropriate thresholding techniques

**Feature Extraction.** The main step to detect the cancer is selection and extraction of the features; as we know performance of system are more dependent on optimization of features' selection than the classification method. We implemented feature extraction using Gray level Co-occurrence Matrix. Gray Level Co-occurrence Matrix (GLCM) is the matrix where the number of rows and columns is equal to number of gray levels (pixel values). The GLCM is a tabulation of how often various combinations of pixel brightness values occur in an image. The Preprocessed image in gray scale is given as input to GLCM.

**Classification.** Artificial neural network (ANN) is a machine learning approach that models human brain and consists of a number of artificial neurons. Neuron in ANNs tend to have fewer connections than biological neurons. Each neuron in ANN receives a number of inputs. An activation function is applied to these inputs that results in activation level of neuron (output value of the neuron). Knowledge about the learning task is given in the form of examples called training examples [8]. An Artificial Neural Network is specified by *Neuron model*, which is the information processing unit of the NN, an architecture that contain a set of neurons and links connecting neurons. Each link has a weight, a learning algorithm that is used for training the NN by modifying the weights shown in Fig.:4.in order to model a particular learning task correctly on the training examples. The neural network classifier structure consists of Input layer, Hidden layer and Output layer. Hidden layer and Output layer. In this methodology, there is one hidden layer with ten hidden neurons and Output layer with one output neuron. The hidden and output layer adjusts weights value based on the output in Classification

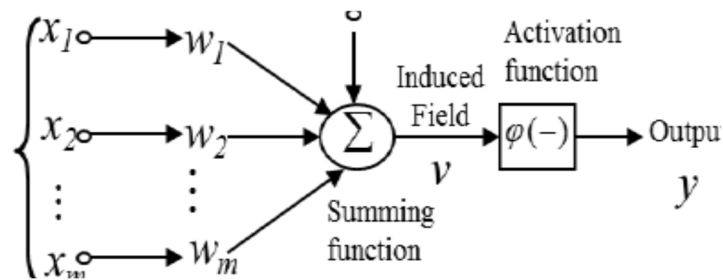


Fig. 4. Neuron diagram.

**Result.** This section details the results of automatic classification on images that acquired by means of dermoscopy technique. Database consists of 101 dermoscopy images, previously diagnosed, 45 of them are melanomas and 51 are non-melanomas. GLCM features were used for feature extraction and neural network for classification. 5 features are selected and these input fed to neural input layer. Corresponding values of each features are extracted and then compared with the values of database using neural networking. Fig. 5 shows the output of each stages. The proposed method trained with 75% and tested with 25% of the total number of images. At the end of the training process updated weight values are stored. Then the performance value is measured final result is shown

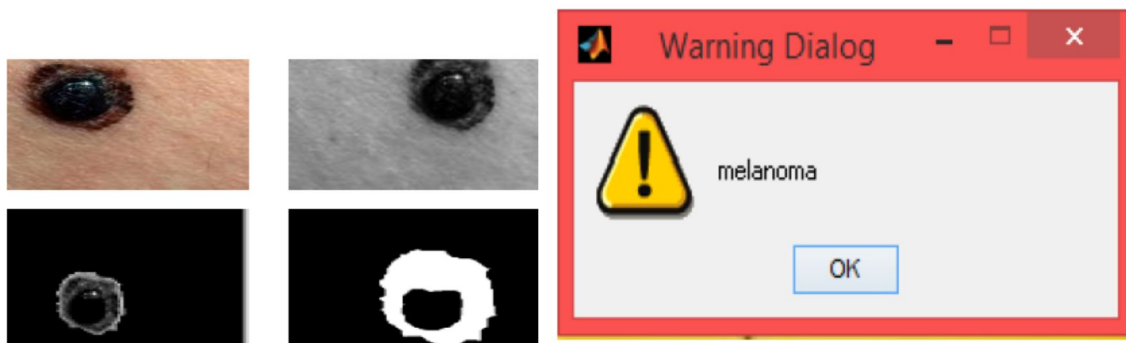


Fig. 5. Classification and detection of melanoma.

**Summary.** It proves to be a better diagnosis method than the conventional biopsy method. This detection method is very advantageous to patients, because it find result faster than biopsy method. This detection method will time consuming. This skin cancer detection method differentiated two types of skin cancer (Melanoma and Non-Melanoma) from each other and found the stages of cancer.

This methodology uses digital image processing technique and artificial neural networks for the classification of cancer image and non-cancer image.

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