# Android Application based Melanoma Detection System

EfficiaCarolin.E[1], Girija.K[2], Kanmani.M[3], Santhanalakshmi.S.T[4]

*Department of Computer Science and Engineering,Panimalar Engineering College,Chennai*

**Abstract**

*Mobile devices including smartphones are being used by billions of people all around the world thus creating an oppurtunity to design a wide range of mobile imaging applications. Among many imaging applications, health care applications have drawn a lot of attention recently.Traditional methods for early detection of melanoma rely upon a dermatologist to visually assess a skin lesion using the ABCDE (Asymmetry, Border-irregularity, Color variation, Diameter, Evolution) criteria before confirmation can be done through biopsy or pathologist. In the proposed system, we have researched on a mobile imaging system for the early diagnosis of melanoma. Our work focuses on smart phone-captured visible light images. Capturing of images under loosely-controlled conditions puts forth challenges for melanoma detection as the smart phone is subject to computation and memory constraints. Thus to address these challenges, we propose to localize the skin lesions by using a fast segmentation algorithm- K means segmentation. Further a feed forward back propagation neural network is designed to improve the quality of classification.*

**Keywords:** K means segmentation, Back propagation, Mobile image analysis, health care imaging.

## I.INTRODUCTION

Among many imaging applications, health related services have drawn a lot of attentions recently. Several methods have been proposed to support efficient and timely image-related diagnosis.Apart from normal imaging health related service.Mobile imaging health related services have the advantages of being practical, low-cost and accessible. The work focuses on attainable detection of malignant melanoma (MM) using mobile image analysis. MM is a type of skin cancer arising from the melanocytes of the epidermis. There are three main types of skin cancers: MM, basal cell carcinoma and squamous cell carcinomas.

Comparison of epiluminescent images and visible light images of skin lesions. epiluminescent images are taken with the aid of liquid medium or non-polarized light source and magnifiers, and they include features under the skin surface (e.g., pigment network, aggregated globules). But in case of visible light images (e.g., taken with smartphones) does not include these features. This work focuses on the analysis of imaging modality that uses visible light.

According to an annual , the American Cancer Society projected 87,110 new melanoma manifestation in the United States by the end of 2017, with almost 9,730 estimated deaths.

MM may be treated successfully, yet the diagnosis depends on its early perception and removal when the cancerous growth is still relatively small and thin. Therefore, there is a pressing need for tools that can assist early and precise detection. **Conventional methods for early detection of melanoma depends upon a dermatologist to visually assess a skin bruise using the ABCDE (Asymmetry, Border irregularity, Color variegation, Diameter, Evolution) criteria before confirmation can be done through surgery by a pathologist**. However, this visual evaluation strategy taken by dermatologists is hindered by clinician subjectivity and suffers from low sensitivity.

Computer aided detective methods based on dermatological images are being developed to help in the melanoma detection process, but most of these methods depends only on peripheral, topographic characteristics that can be limiting in characterizing skin cancer. In this work, a hybrid characteristic model is introduced for characterizing skin bruise that combinelow- level and high-level features, and supplements them with a set of physiological characteristics extracted from dermatological images.

While detection by dermatologists is precise, a health centre visit may be less easily accessible and may require the primary surgeons to make the initial referral. There is a need for the public to be educated and equipped with a more accessible method of self-assessment for early detection of melanoma. The ever-increasing availability of smart phones equipped with multi-core CPUs and high resolution photographic sensors have the potential to empower people to become more proactive and engaged in their own healthcare processes.

## II.PROPOSED SYSTEM

The proposed system uses the smartphones as the platform with the goal that the general public can make use of mobile health system for preliminary diagnosis in early stage.The proposed system has two major components. The first component , is a light weight segmentation for skin lesion localization. The second component is used to select good feature for classification and includes a classifier array to fuse the classification results. Using visible light photography captured from smartphones for automatic melanoma detection is quite noval. Most previous works focused on dermoscopic images that are captured in the well-controlled clinical environments with specialized equipments. We need to design efficient algorithms and system feasible for the strict computation, memory and power constraints of a smartphone for performing the image analysis.

- We propose a K-means segmentation and back propagation NN algorithm suitable for the resource-constrained smartphone. Our localization algorithm comprises skin / non-skin detection, K means segmentation and back propagation.
- We investigate feature selection to identify a small set of the most discriminative features to be used in the smartphone. Using a small set of discriminative features not only reduces the storage and computation overhead but also improves the classification performance.
- We study the Human Computer Interface (HCI) aspect of the proposed system.

## III.RELATED WORKS

Depending on the mechanism used to evaluate the skin lesion, melanoma diagnosis schemes can be classified into the following classes: manual methods , which require the visual inspection by an experienced dermatologist, and auto- mated (computed-aided) schemes, that perform the assessment without human intervention. A different class, called hybrid schemes, can be identified when dermatologists jointly combine the computer-based result, context knowledge (e.g., skin type, age, gender) and his experience during the final decision.

In general, an automatic melanoma analysis system can be constructed in four main phases. The first phase is the image acquisition which can be performed through various devices such asdermatoscope, spectroscope, standard digital camera or camera phone. The images acquired by these devices exhibit peculiar features and different qualities, which can significantly change the outcome of the analysis process. The second phase involves skin detection, by removing artifacts and lesion border localization. The third phase computes a compact set of discriminative features. Finally, the fourth phase classifies the lesions based on the extracted features.

There is a excess of computer-aided systems for segmentation and classification of skin bruise. Most of these works investigated for bruise segmentation of a dermoscopic image by using K-means segmentation methods such as histogram thresholding, adaptive thresholding, difference of Gaussian filter, morphological thresholding, wavelet transform, adaptive snake and random walker algorithm. However, it is worth noting that these works focused on dermoscopic images which are acquired under controlled clinical conditions by employing a non-polarized light source and magnifiers. This type of images includes characteristics below the skin surface which cannot be captured with standard cameras.It is also worth noting that many of the works focused on only a certain aspect such as lesion border localization, and they did not provide a complete solution that integrates all the steps. In addition, they focused on processing on powerful workstations or servers, where computation and memory are abundant. In the cases of dispensable memory and computation capability, recent dermoscopic images-based melanoma detection grip the power of deep neuron network (DNN) as this could help to achieve very competitive performances. Recently, several mobile connected dermatoscopic devices have been developed, such as DermLite and HandyScope (FotoFinder Systems, Germany). However, the cost to an additional device is expensive and they are not accessible to everyone. Furthermore, trained personnel are required to operate dermatoscopic devices. There are only few systems working on mobile platforms: Lubax (LubaxInc, CA, USA). However, many methods merely use the mobile device for capturing, storing and transmission of the skin lesion images to a remote server without performing any computation locally on the mobile device. For example, use a mobile dermatoscope attached to the mobile device to capture dermatoscopic images and send the images to the server for computer assessment. A few isolated works perform the analysis of captured visible-light images directly on the mobile devices. In a mobile-system working for images taken from mobile cameras is presented. In particular, they presented a preliminary system: to detect a lesion, they used a very basic thresholding method; to describe the lesion, only standard color feature such as mean and variance of the color channels, the difference of color through vertical axis and border features such as convexity, compactness are extracted.

The bruise detection and feature extraction are performed on mobile while the classification can be performed on mobile or cloud. However, the authors put more emphasis on the system integration, without mentioning the details of the features used for diagnosis. Recently, the works propose complete systems that segment, extract visual features and classify lesions. In addition to the automatic extracted color and texture characteritics, additional human annotated information, including bruise's locations, size, number of lesions, etc. is also utilized to differentiate melanoma from nevocellularnaevi.

The work only uses the automatically extracted features, which are based on the ABCD rule, i.e., Asymmetry, Border, Color, and Diameter features, for the classification process. Different from these works, which only use general features such as mean, variance of different color channels, convexity, solidity, compactness of shape etc., in our work, we propose novel and robust features specifically for characterization of lesions. We also propose a novel feature selection method to select a small but very discriminative set of features which not only helps boost the classification accuracy but also reduce the computation and memory costs. Additionally, even though the works propose complete systems, the efficiency of these systems running on resource-constrained smartphones has not been reported. On the other hand, our method is very efficient on a smartphone as discussed in Section IV-F. Recently, there are several DNN-based systems that have been proposed for non-dermatoscopic image analysis such as lesion segmentation and melanoma detection. However, due to the high computation and memory cost of DNN, it is very challenging for such systems to be used on resource constrained smartphone platforms.

## IV.PROPOSED WORK

In the proposed system, a melanoma detection mechanism is designed which is optimized to run entirely on the resource constraint smartphones. It intends to localize the skin lesion by means of segmentation approach, image processing feature extraction and finally classification is carried out by back propagation NN for enhanced results.

Initially, the skin image is captured by means of high resolution smartphone camera. The image then is subjected to down sampling where high frequency portions are converted into uniform low frequency portions.The image is then preprocessed and undergoes morphological feature extraction.The image is then given as input to a trained neural network model which is capable of classifying the state of the lesion. The neural network is trained by using a target database which is composed of dermatogically screened lesion images.

Statistical analysis is carried out for calculating the severity of the disease.

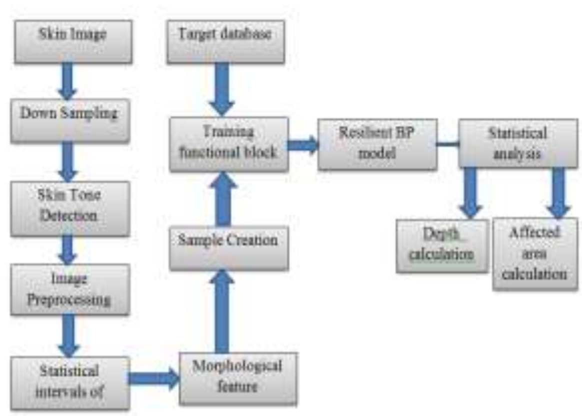



Fig 1: Experimental system design for melanoma detection

## V.METHODOLOGY

### IMAGE PROCESSING:

Image processing is photography. In this process, an image is captured or scans using a camera to create a digital or analog image. In order to produce a physical picture, the image is processed using the appropriate technology based on the source type. In digital photography ,the image is stored as a computer file format. This file is translated using photographic software to produce an actual image. The colors, shading, and noises are captured at the time the photograph is taken the software translates this information into an image.

A whole range of new applications and tools is created by digital imaging. Face recognition software, medical image processing and remote sensing are allpossible by digital image processing development. Specialized computer source code are used to enhance and correct images, one must obtain the values of its RGB primaries in linear intensity encoding by gamma expansion for grey scale conversion. Then, add together 30% of the red value, 59% of the green value, and 11% of the blue value and these weights depend on the exact choice of the RGB primaries, but are typical.

### IMAGE ACQUISITION:

**I**n the process, the first step in the process is image acquisition that is to acquire a digital image. It highly requires an imaging sensor and the capability to digitize the signal produced by the sensor. The sensor could be a monochrome or color TV camera that produces an entire image of the problem domain every 1/30 sec. The imaging sensor could also a line-scan camera that produces a single image line at a time. In this case, the object's motion past the line scanner produces two-dimensional image. An analog-to-digital converter digitizes the output of the camera.The nature of the sensor and image it produces are determined by the application.

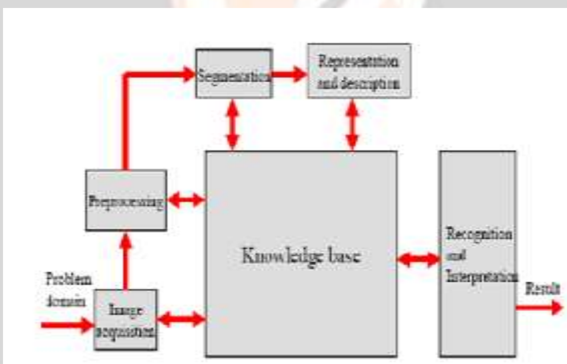



Fig 3: Image acquisition and segmenation

### IMAGE PREPROCESSING:

The key function of preprocessing is to improve the image in ways-that increase the chances for success of the other processes. Preprocessing deals with techniques for enhancing contrast, removing noise, and isolating regions whose texture indicate a alphanumeric information.

- Image Enhancement.
- More suitable than original image for a specific application.
- Image Restoration.
- A process that attempts to reconstruct or recover an image that has been degraded using prior knowledge of the degradation concept.

**IMAGE SEGMENTATION:**

Segmentation partitions an input image into its small constituent parts or objects. One of the most difficult tasks in digital image processing is autonomous segmentation. On the one hand, a rugged segmentation procedure brings the process a long way towards the successful solution of an imaging problem. On the other hand, weak or erratic segmentation algorithms almost guarantee eventual failure.

.In character recognition, the significant role of segmentation is to extract individual characters and background words.


Fig 4: Original image Fig 5: Binary image

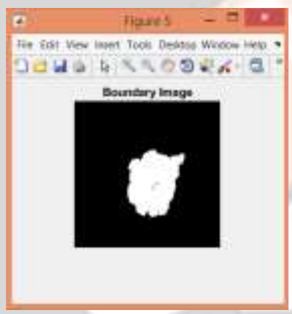
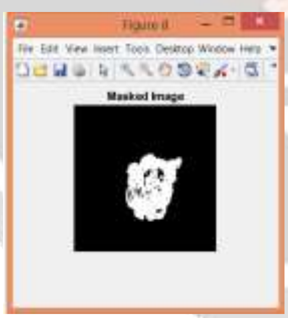




Fig 6: Boundary image Fig 7:Skin Binary image



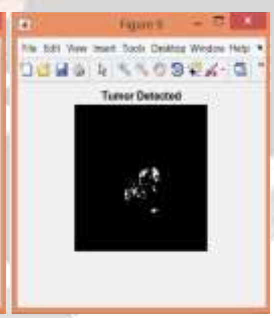




Fig 8: Masked image Fig 9:Tumour detected

## VI.EXPERT SYSTEM FOR MELANOMA DETECTION

***K-MEANS SEGMENTATION:***

K-Means is a least-squares partitioning method that divide a collection of objects into K groups.

Step 1: Insert the original images as input.

Step 2: Convert the RGB to grayscale image.

Step 3: Cluster dataset images.

Step 4: Find out the 'k' in image by algorithm .

Step 5: Randomly choose the k cluster centers.

Step 6:Calculate area or depth calculation in segmented image.

Step 7: Calculate the distance between each pixel to each cluster centre.

Step 8: If the distance is near to the centre then move to that cluster.

Step 9: Otherwise move to next cluster.

Step10: Repeat the process until the segmentation portion comes.

The initial random assignment of points to clusters can be done. In the course of the iterations, the algorithm tries to minimize the overall groups, of the squared within group errors, which are the distances of the points to the respective group means.Convergence is reached when the objective function (i,e., the residual sum-of squares) cannot be lowered any more.The groups obtained are such they geometrically as compact as possible around their respective means.

## CLASSIFICATION:

It is final stage in melanoma detection. Like other machine learning methods, neural networks have been used to solve a wide variety of tasks that are hard to solve using ordinary rule-based programming.The word network in the term 'artificial neural network' refers to the inter–connections between the neurons in the different layers of each system. An example system has three layers. The first layer has input neurons, which send data via synapses to the second layer of neurons, and then via more synapses to the third layer of output neurons. More complex systems will have more layers of neurons with some having increased layers of input neurons and output neurons. The synapses store parameters called "weights" that manipulate the data in the calculations.

Artificial Neural Network is used to perform classification task based on data summarize in feature database. For this purpose we are going to use most popular and widely used back propagation ANN which is excellent for performing classification task. While designing ANN we will decide best configuration of number of layers, number of neurons in each layer and minimum number of training samples on the experimental basis. While performing such experiment , identification factor for each disease will be the parameter under consideration.

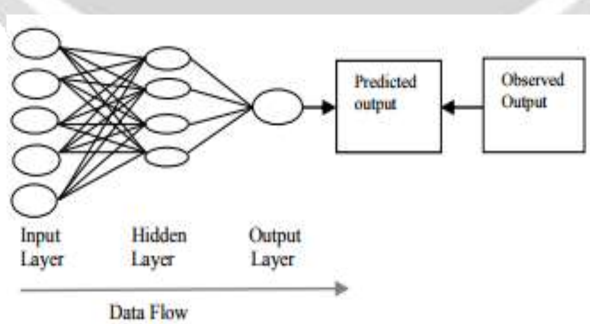



Fig 10: Experimental design for neural network

This process mostly employ trial and error methods, in which ANN training starts with a small number of neurons, and additional neurons are gradually added until desired performance target is achieved. There is no standard theoretical consideration for determining the optimum network configuration for specific problem.We will use a well-known statistical analysis technique called ANOVA, for determining the optimal configuration of neural network.

## VII.CONCLUSION

Using mobile image analysis ,we propose an accessible mobile health-care solution for melanoma detection. The main characteristics of the proposed system are: an efficient K-means segmentation scheme suitable for the resource constrained platform, a new set of features which efficiently capture the color variation and border irregularity from the smartphone-captured image, and a new mechanism for selecting a compact set of the most discriminative features. The experimental results based on 184 camera images demonstrate the efficiency of the prototype in accurate segmentation and classification of the skin lesion in camera images. We foresee several possible usage scenarios for the current solution: it could be employed by the general public for preliminary self-screening or it can assist the general physicians during the diagnosis process. In addition to the technical development, we paid attention also to understand the usability and acceptance challenges. For this purpose, we have investigated the HCI design issues through an exploratory case study and semi-structured interviews. Our study discovered several important HCI issues that should be addressed in future work.

## REFERENCES

[1]McKinion,J.M.,andH.E.Lemmon."Expertsystemsforagriculture."ComputersandElectronicsin Agriculture1.1(1985):31-40.

[2]Jat,AvnishSingh,SumaDawn,AbhinavMishra, andAmitKumar."Asperger'sDisorder :Application for its Treatment through EmotionDetection."

[3]D.Toppeta,''TheSmartCityVision: How innovation and ICT can build Smart, Livable, sustainable Cities'',iThink,Report 005,2010.

[4]Urbanization and health, Bulletin of the World health Organization,Volume88,Number4 ,April 2010,pp.245-246.

[5]B.JIETALArtificialneuralnetworksforrice yieldpredictioninmountainousregions.Journalof agriculturalScience(2007),145,249–261.

[6]B.A.Smithetal,.ArtificialNeuralNetworksfor AutomatedYearroundTemperaturePrediction. ComputersandElectronicsinAgriculture68(2009)

[7]Cheng,B.andTitterington,D.M.(1994).Neural networks:Areviewfromastatisticalperspective StatisticalScience,9:2-54.

[8]D.L.Ehretetal,Neuralnetworkmodelingof greenhousetomatoyield,growthandwaterusefrom automatedcropmonitoringdata.Computersand ElectronicsinAgriculture79(2011)82–89.

[9]SavitaN.Ghaiwat,ParulArora,"Detectionand ClassificationofPlantLeafDiseasesUsingImage processingTechniques:AReview",InternationalJournal of Recent Advances in Engineering and Technology,ISSN:2347-2812,Volume2,Issue3,2014

[10]Prof.SanjayB.DhaygudeandMr.NitinP," AgriculturalplantLeafDiseaseDetection Using Image Processing"InternationalJournalof Advanced Research in Electrical,Electronics and Instrumentation Engineering, Volume2,Issue,2013.

[11]Mr.PramodandS.landge,"Automatic Detection Classification of Plan tDisease through Image Processing",International Journa lof Advanced Research in ComputerScience and Software Engineering,Volume3,Issue7,ISSN:2277128X,2013.

.