JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# SKIN CANCER DETECTION BY FCM AND CLASSIFICATION OF DERMOSCOPY IMAGES USING SVM

**Manikandan.S, P Kokila**

MCA Student, Professor MCA

Hindusthan college of arts and science

## ABSTRACT

In this research, we aim to propose an intelligent automated method for identification of the type of skin lesions using machine-learning techniques. Two types of texture feature have been used to perform classification of melanoma and non-melanoma. First local information through Local Binary Pattern (LBP) on different scales and Gray Level Co-Occurrence Matrix (GLCM) at different angles has been extracted as a texture feature. Fuzzy C-means (FCM) is a method of clustering which allows one piece of data to belong to two or more clusters. Segmentation is performed by using Fuzzy Clustering Means because it has robust characteristics for ambiguity and can retain much more information than hard segmentation methods.Support vector machine has been used as a classifier to classify melanoma and non-melanoma. Experiments have been tested on well-known dataset dermis that is freely available on the Internet. The proposed method has been compared with state of the art methods and shows better performance in comparison to the existing methods.

## 1. INTRODUCTION

Nowadays each individual and organization - business, family or institution can access a large quantity of data and information about itself and its environment. This data has the potential to predict the evolution of interesting variables or trends in the outside environment, but so far that potential has not been fully exploited. There are two main problems. Information is scattered within different archive systems that are not connected with one another, producing an inefficient organization of the data. There is a lack of awareness about statistical tools and their potential for information elaboration. This interferes with the

production of efficient and relevant data synthesis. Two developments could help to overcome these problems. First, software and hardware continually, offer more power at lower cost, allowing organizations to collect and organize data in structures that give easier access and transfer. Second, methodological research, particularly in the field of computing and statistics, has recently led to the development of flexible and scalable procedures that can be used to analyze large data stores. These two developments have meant that data mining is rapidly spreading through many businesses as an important intelligence tool for backing up decisions.

Data mining is to reach to large – scale data. In this chapter phases of data until analyzing, methods of analysis and the way it is used in medical data is mentioned. The first part is about the data mining and second part the medical data mining.

Data mining refers to extracting or "mining" knowledge from large amounts of data. The term is actually a misnomer. Remember that the mining of gold from rocks or sand is referred to as gold mining rather than rock or sand mining. Thus, data mining should have been more appropriately named "knowledge mining from data," which is unfortunately somewhat long. "Knowledge mining," a shorter term may not reflect the emphasis on mining from large amounts of data. There are many other terms carrying a similar or slightly different meaning to data mining, such as knowledge mining from databases, knowledge extraction, data/pattern analysis, data archaeology, and data dredging.

Many people treat data mining as a synonym for another popularly used term, Knowledge Discovery in Databases, or KDD. Alternatively, others view data mining as simply an essential step in the process of knowledge discovery in databases.

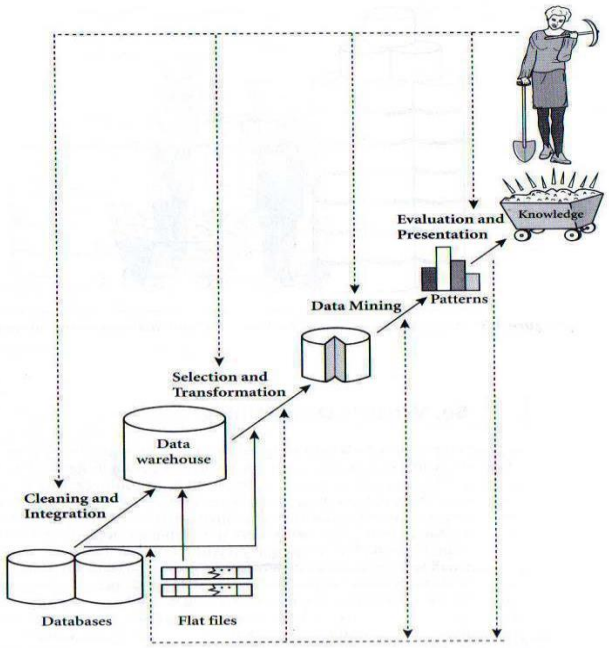
Knowledge discovery as a process is depicted in Figure 2.1 and consists of an iterative sequence of the following steps: ( Han, Kamber, 2001)

1. Data cleaning (to remove noise and inconsistent data)

2. Data Integration (where multiple data sources maybe combined)

3. Data selection (where data relevant to the analysis task are retrieved from the database)

4. Data transformation (where data are transformed or consolidated into forms appropriate for mining by performing summary or aggregation operations, for instance).




Data mining as a step in the process of knowledge discovery

5. Data mining (an essential process where intelligent methods are applied in order to extract data patterns)

6. Pattern evaluation (to identify the truly interesting patterns representing knowledge based on some interestingness measures)

**7.** Knowledge presentation (where visualization and knowledge representation techniques are used to present the mined knowledge to the user).

## 1.1 OVERVIEW OF THE PROJECT

Melanoma is a form of skin cancer that occurs in the melanocytes, which are cells in the outer layer of the skin (the epidermis). Melanocytes produce the skin coloring or pigment known as melanin, which gives skin its tan or brown color and helps protect the deeper layers of the skin from the harmful effects of the sun. Melanoma develops when melanocytes undergo malignant transformation, become abnormal, grow uncontrollably and aggressively invade surrounding tissues. Melanoma may affect only the skin, or it may spread through the blood or lymph system to other organs and bones.

Melanoma is the most serious form of skin cancer. Melanoma may be cured if caught and treated early, but, if left untreated, the majority of melanomas eventually spread to other parts of the body. Early detection and surgery to remove the melanoma are successful in curing most cases of melanoma; however, it is rarely curable in its later stages.

Internationally, the incidence of melanoma varies greatly, with the highest incidence occurring in Australia, the United States, Norway, Switzerland, Sweden, Denmark and Israel, and the lowest incidence in Japan, the Philippines, China and India.

Melanoma commonly afflicts the young and middle aged; however, people of all ages are at risk. It is the most common cancer in young adults aged 20-30 and is the leading cause of cancer death for women aged 25-30. Melanoma is significantly more prevalent among white populations than in blacks and Asians; the incidence of melanoma in blacks is approximately 1/20 than that of whites.There has been a dramatic increase in melanoma incidence over the last century. Fortunately, due to prevention and early detection practices, melanoma mortality rates have not increased as sharply and have remained stable or decreased since the 1990s.Skin cancer is the most common of all cancer types. In skin cancer number of cases has been going up over the past few decades. Many skin cancers are caused by much exposure to ultraviolet (UV) rays. Most of this exposure comes from the sun and man-made sources. The three most common type are given below.

Melanoma: Melanoma begins in melanocytes (pigment cells). Melanoma can occur on any skin surface. Melanoma is rare in people with dark skin. It is found on skin on the head, on the neck, between the shoulders and the hips, on lower legs, on palms of the hands, on the soles of feet or under the finger nails.

Basal Cell Skin Cancer: Basal cell skin cancer begins in the basal cell layer of the skin. It is usually occurs in places that have been in the sun. In fair people basal cell skin cancer is the most common type of skin cancer.

Squamous Cell Skin Cancer: Squamous cell skin cancer begins in squamous cells. In dark people squamous cell skin cancer is the most common type of skin cancer and its usually found in places that are not in the sun such as the legs or feet. According to the previous researches, if the cancer detected in early stage, the treatment rate will be more than 90% while it will be less than 50% if detected lately.

One of the most important factors to reduce the mortality rate of melanoma is detecting it early. But distinguishing the skin cancer from other benign pigmented skin lesions is a big challenge and not an easy task even for dermatologists. Several clinical methods have been used to improve diagnostic accuracy, but effective ways to extend the diagnoses to dermatologist are still lacking.

## 1.2 MODULE DESCRIPTION

The proposed methodology aims to model disease detection/classification and a promising disease grading system for pomegranate patient Skin  Skin images. The system makes use of various image processing techniques. The proposed work is mainly divided into four Modules:

- Preprocessing and data acquisition

- segmentation
- feature extraction
- classification

Finally, treatment advisory module is built to make it as a kiosk for the patient for proper control and management of pomegranate eye.

**Pre-processing**

In a Human body the cell that grows out of control forms a tumour called cancer. The tumour found in the Skin s is named after it as Skin cancer which endangers the human life the early identification increase the patient's survival in this world. For detection of Skin images are the computer aided diagnosis techniques are used. This research mainly discuss about the pre-processing and segmentation process. Pre-processing step focus to reduce the noises in Skin image and segmentation refers to the process of partitioning the pre-processed skin image into multiple regions. The pre-processing stage performs two tasks, namely, de-noising and segmentation. Here, for noise Reduction Median Filter is used and for disease part detection sobel converter is used.

**Segmentation**

Skin segmentation is usually the second step of Skin image analysis and plays an important role in Skin disease diagnosis. It is visible that the Skin is the darker regions in the Skin images. The procedure proposed in this stage canter around isolating the Region of Interest (ROI), that is the Skin image, from its experience. We segment Skin structures from each slice of the Skin image and try not to lose the possible region of interests attached to the Skin wall. There are some nodules which may be attached to the Skin wall. I will first explain a common method using simple Image Processing and Morphological operations to segment the Skin s and then will give references and summaries to good links of papers. In any case, because of the differed shading and surface property of Skin pictures, wavelets have the deficiency of collection locales that outcome in off base division. Along these lines to take care of this issue, surface, shading or a combination of these highlights were utilized for gathering districts. The calculation abuses shading and surface highlights in wavelet space and some bunching calculation amid division. The process of accurately identifying regions and boundaries of the Skin field from surrounding thoracic tissue is an essential first step in pulmonary image analysis of many clinical decision support systems.

**Feature Extraction and Selection**

The main aim of the second phase is to convert the image data into a format that simplifies the process of matching between Skin images. This phase consists of two steps, namely, Feature Extraction and Feature Selection. The feature extraction step functions to discover various features that best represent a Skin

image. As the number of features selected is normally very high, a feature selection algorithm is used in the second stage, to select the most prominent features. During feature extraction, five categories of features were extracted. They are geometric features, color features, texture features, fractal features and Skin related features. Most of the studies related to Skin image recognition use only Skin , color and texture features. In this study, the geometric and fractal characteristics were also considered.

**Classification**

The last phase of the study is the task of identifying the Skin diseases to which the input Skin Skin image belongs and is very important for medical identification field. The algorithm mainly revolves round an iterative recognition procedure that matches the features extracted from the input Skin ct image with feature vectors representing the Skin Skin image of the pre-built dataset. In this research artificial neural network (ANN) is used.

## 2. SYSTEM STUDY

### 2.1 Existing Method

In the Existing method, it proposed a novel method where based on very deep CNNs with a set of effective training schemes in order to meet the challenges of automated melanoma recognition. Similar to some previous works, segment the skin lesions from dermoscopy images and then classify them into melanoma ones and non-melanoma ones so that the classification stage can extract more specific and representative features within the lesion regions instead of performing it in the whole dermoscopy images. In this existing method very deep networks (more than 50 layers) for both the segmentation and the classification stages in order to obtain more discriminative features for more accurate recognition. To overcome the degradation problem when a network goes deeper, here utilize residual learning technique in the framework. For effective and accurate skin lesion segmentation, further construct a fully convolutional residual network (FCRN) incorporating a multi-scale contextual information integration scheme.

### 2.1.1 Disadvantages:

- Time consumption
- Poor Edge detection.
- Low performance parameters
- SVM algorithm is not suitable for large data sets.
- SVM does not perform very well when the data set has more noise i.e. target classes are overlapping.
- In cases where the number of features for each data point exceeds the number of training data samples, the SVM will underperform.

### 2.2 Proposed methods

In this research, we aim to propose an intelligent automated method for identification of the type of skin lesions using machine-learning techniques. Two types of texture feature have been used to perform classification of melanoma and non-melanoma. First local information through Local Binary Pattern (LBP) on different scales and Gray Level Co-Occurrence Matrix (GLCM) at different angles has been extracted as a texture features. These features are robust due to scale invariant property of LBP and rotation invariant property of GLCM features. Global information of different colors channels has been incorporated through four different moments extracted in various different color spaces like RGB, HSV etc., Experiments have been tested on well-known dataset dermis that is freely available on the Internet. The proposed method has been compared with state of the art methods and shows better performance in comparison to the existing methods.

#### 2.2.1 Advantages

- The combination of multi structure morphological process and Segmentation technique used effectively for lung segmentation and lung diseases classification.
- ANN classification algorithm used
- Performance evaluation is better than other existing algorithm in terms of accuracy, precision, f1-score, and specificity.

## 3. SYSTEM REQUIREMENT

### 3.1 HARDWARE REQUIREMENT

The following hardware requirements are needed to implement this framework

Minimum Requirements:

- Processor : Pentium II class, 450MHz
- RAM : 128MB
- Hard Disk Drive : 3GB
- Video : 800X600, 256 colors
- Camera
- CD-ROM : Required

## 3.2 SOFTWARE REQUIREMENT

- MATLAB 2013a

### SOFTWARE DESCRIPTION

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

Typical uses of MATLAB include:

- Math and computation
- Algorithm development
- Modeling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including Graphical User Interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C or FORTRAN.

### ADVANTAGES OF MATLAB

Its basic data element is the matrix. A simple integer is considered an matrix of one row and one column. Several mathematical operations that work on arrays or matrices are built-in to the Matlab environment. For example, cross-products, dot-products, determinants, inverse matrices.

- Vectorized operations. Adding two arrays together needs only one command, instead of a for or while loop.
- The graphical output is optimized for interaction. You can plot your data very easily, and then change colors, sizes, scales, etc, by using the graphical interactive tools.
- MATLAB's functionality can be greatly expanded by the addition of toolboxes. These are sets of specific functions that provided more specialized functionality.

### MATLAB SYSTEM

The MATLAB system consists of five main parts:

- **Development Environment**

This is the set of tools and facilities that help you use MATLAB functions and files.

Many of these tools are graphical user interfaces. It includes the MATLAB desktop and Command Window, a command history, and browsers for viewing help, the workspace, files, and the search path.

- **The MATLAB Mathematical Function Library**

This is a vast collection of computational algorithms ranging from elementary functions like sum, sine, cosine, and complex arithmetic, to more sophisticated functions like matrix inverse, matrix eigenvalues, Bessel functions, and fast Fourier transforms.

- **The MATLAB Language**

This is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both "programming in the small" to rapidly create quick and dirty throw-away programs, and "programming in the large" to create complete large and complex application programs.

- **Graphics:**

MATLAB has extensive facilities for displaying vectors and matrices as graphs, as well as annotating and printing these graphs. It includes high-level functions for two-dimensional and three-dimensional data visualization, image processing, animation, and presentation graphics. It also includes low-level functions that allow you to fully customize the appearance of graphics as well as to build complete graphical user interfaces on your MATLAB applications.

**GRAPHICAL USER INTERFACE (GUI):**

MATLAB's Graphical User Interface Development Environment (GUIDE) provides a rich set of tools for incorporating graphical user interfaces (GUIs) in M-functions. Using GUIDE, the processes of laying out a GUI (i.e., its buttons, pop-up menus, etc.)and programming the operation of the GUI are divided conveniently into two easily managed and relatively independent tasks. The resulting graphical M-function is composed of two identically named (ignoring extensions) files:

- A file with extension .fig, called a FIG-file that contains a complete graphical description of all the function's GUI objects or elements and their spatial arrangement. A FIG-file contains binary data that does not need to be parsed when he associated GUI-based M-function is executed.

- A file with extension .m, called a GUI M-file, which contains the code that controls the GUI operation. This file includes functions that are called when the GUI is launched and exited, and call-back functions that are executed when a user interacts with GUI objects for example, when a button is pushed.

**ADVANTAGES**

- Flexibility and portable system
- Less Cost and compact
- Effective security system
- Alert system
- Optimized System

**APPLICATIONS**

- Security applications
- Image processing applications
- Banking applications

**Melanoma-skin cancer:**

Melanoma is a form of skin cancer that occurs in the melanocytes, which are cells in the outer layer of the skin (the epidermis). Melanocytes produce the skin coloring or pigment known as melanin, which gives skin its tan or brown color and helps protect the deeper layers of the skin from the harmful effects of the sun. Melanoma develops when melanocytes undergo malignant transformation, become abnormal, grow uncontrollably and aggressively invade surrounding tissues. Melanoma may affect only the skin, or it may spread through the blood or lymph system to other organs and bones.

Melanoma is the most serious form of skin cancer. Melanoma may be cured if caught and treated early, but, if left untreated, the majority of melanomas eventually spread to other parts of the body. Early detection and surgery to remove the melanoma are successful in curing most cases of melanoma; however, it is rarely curable in its later stages.

Internationally, the incidence of melanoma varies greatly, with the highest incidence occurring in Australia, the United States, Norway, Switzerland, Sweden, Denmark and Israel, and the lowest incidence in Japan, the Philippines, China and India.

Melanoma commonly afflicts the young and middle aged; however, people of all ages are at risk. It is the most common cancer in young adults aged 20-30 and is the leading cause of cancer death for women aged 25-30. Melanoma is significantly more prevalent among white

populations than in blacks and Asians; the incidence of melanoma in blacks is approximately 1/20 than that of whites.There has been a dramatic increase in melanoma incidence over the last century. Fortunately, due to prevention and early detection practices, melanoma mortality rates have not increased as sharply and have remained stable or decreased since the 1990s.Skin cancer is the most common of all cancer types. In skin cancer number of cases has been going up over the past few decades. Many skin cancers are caused by much exposure to ultraviolet (UV) rays. Most of this exposure comes from the sun and man-made sources. The three most common type are given below.

Melanoma: Melanoma begins in melanocytes (pigment cells). Melanoma can occur on any skin surface. Melanoma is rare in people with dark skin. It is found on skin on the head, on the neck, between the shoulders and the hips, on lower legs, on palms of the hands, on the soles of feet or under the finger nails.

Basal Cell Skin Cancer: Basal cell skin cancer begins in the basal cell layer of the skin. It is usually occurs in places that have been in the sun. In fair people basal cell skin cancer is the most common type of skin cancer.

Squamous Cell Skin Cancer: Squamous cell skin cancer begins in squamous cells. In dark people squamous cell skin cancer is the most common type of skin cancer and its usually found in places that are not in the sun such as the legs or feet. According to the previous researches, if the cancer detected in early stage, the treatment rate will be more than 90% while it will be less than 50% if detected lately.

One of the most important factors to reduce the mortality rate of melanoma is detecting it early. But distinguishing the skin cancer from other benign pigmented skin lesions is a big challenge and not an easy task even for dermatologists. Several clinical methods have been used to improve diagnostic accuracy, but effective ways to extend the diagnoses to dermatologist are still lacking.

RISK FACTORS OF SKIN

The usual risk factors associated with cancer, e.g., cigarette smoking, are not associated with melanoma risk. Rather, melanoma risk factors include sun exposure, family history, genetics and phonotypical traits such as skin, hair and eye color.Known risk factors for melanoma of the skin include:

- Previous melanoma or other skin cancer

- Family history of melanoma
- Atypical moles (dysplastic nevi)
- 50 or more moles
- History of exposure to ultraviolet (UV) radiation, including UV exposure at tanning salons
- History of sunburns, particularly severe sunburns in childhood
- White race, especially people who have fair skin that burns rather than tans
- Red or blonde hair
- Blue eyes
- Many (extensive) freckles on the upper back
- Other cancers such as leukemia or lymphoma
- Impaired immune system
- Moles that are present at birth, especially if the moles are larger than 20 cm (giant congenital melanocytic nevus)
- Equatorial latitudes
- Xeroderma pigmentosum - a rare inherited disease in which the body cannot repair damage to cells by UV radiation from the sun
- PUVA treatment, used to treat skin conditions such as psoriasis

Hence, the motivation of developing a computer aided diagnose system was most evident these days. In this research, has proposed a method to classify the pigmented dermoscopic images into melanoma and non-melanoma.

- **The MATLAB Application Program Interface (API)**

This is a library that allows you to write C and FORTRAN programs that interact with MATLAB. It include facilities for calling routines from MATLAB (dynamic linking), calling MATLAB as a computational engine, and for reading and writing MAT-files.

**IMAGE PROCESSING TOOLBOX**

Image Processing Toolbox provides a comprehensive set of reference-standard algorithms, functions for image processing from which image analysis, image segmentation, image enhancement,

noise reduction, geometric transformations, and image registration can be performed. Image Processing Toolbox supports a diverse set of image types, including high dynamic range, giga-pixel resolution.

Visualization functions and apps let you explore images and videos, examine a region of pixels, adjust color and contrast, create contours or histograms, and manipulate regions (ROIs). The toolbox supports workflows for processing, displaying, and navigating large images.

**Python**

Images define the world, each image has its own story, it contains a lot of crucial information that can be useful in many ways. This information can be obtained with the help of the technique known as Image Processing. It is the core part of computer vision which plays a crucial role in many real-world examples like robotics, self-driving cars, and object detection. Image processing allows us to transform and manipulate thousands of images at a time and extract useful insights from them. It has a wide range of applications in almost every field. Python is one of the widely used programming languages for this purpose. Its amazing libraries and tools help in achieving the task of image processing very efficiently. Through this article, you will learn about classical algorithms, techniques, and tools to process the image and get the desired output.

**OpenCV**

It stands for Open Source Computer Vision Library. This library consists of around 2000+ optimised algorithms that are useful for computer vision and machine learning. There are several ways you can use opencv in image processing, a few are listed below:

- Converting images from one color space to another i.e. like between BGR and HSV, BGR and gray etc.
- Performing thresholding on images, like, simple thresholding, adaptive thresholding etc.
- Smoothing of images, like, applying custom filters to images and blurring of images.
- Performing morphological operations on images.
- Building image pyramids.
- Extracting foreground from images using GrabCut algorithm.
- Image segmentation using watershed algorithm.

## BASIC CONCEPTS

### Human Skin

The skin is the largest organ of the body. It provides protection against heat, sunlight, injury, and infection. Skin also helps in controlling body temperature and stores water, fat, and vitamin D.

## Types of Skin

There are two main kinds of human skin as shown in Figure 1.1 One is glabrous skin (non-hairy skin), which is found on the palms and soles, it is grooved on its surface by continuously alternating ridges and sulci, which has unique configurations for individuals, known as dermatoglyphics. It is characterized by a thick epidermis which is divided into several well-marked layers, including a compact stratum corneum, by the presence of encapsulated sense organs within the dermis, and by a lack of hair follicles and sebaceous glands.

Second type is the hair-bearing skin which has both hair follicles and sebaceous glands but lacks encapsulated sense organs. There is also wide variation in skin types between different body sites.

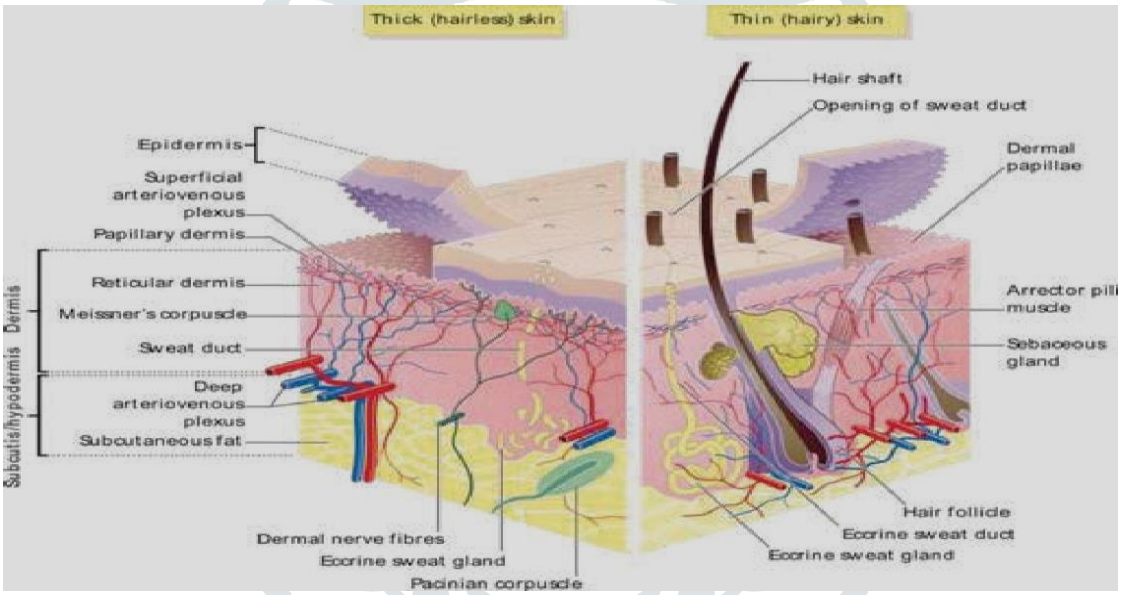



**Figure Types of Human Skin**

## Layers of Human Skin

Skin is majorly composed of three primary layers as shown in Figure 1.2.

- The epidermis, which provides waterproofing and serves as a barrier to infection
- The dermis, which serves as a location for the appendages of skin including hair, sweat glands and sebaceous glands
- The hypodermis (subcutaneous adipose layer) Figure

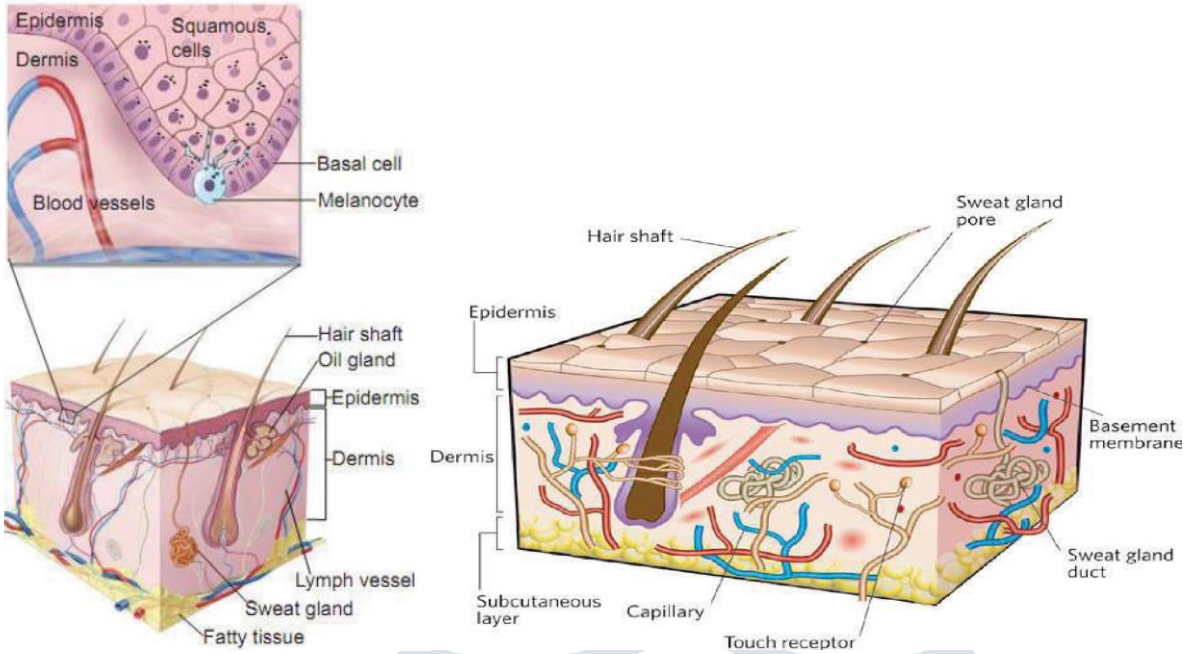



**Figure Layers of Human Skin**

**Skin Cancer**

Like all body tissues, the skin is also made of tiny building blocks called cells. These cells can sometimes become cancerous, from exposure to ultraviolet radiation or certain other reasons like family history etc.

The abnormal growths on the skin can be categorized as benign (not cancer) or malignant (cancer). Benign growths are not as very harmful as malignant growths. Benign growths (such as moles) are rarely a threat to life and generally can be removed and usually do not grow back again. Benign tumors do not invade the tissues around them and thus do not spread to other parts of the body.

On the other hand, Malignant growths (such as melanoma, basal cell cancer, or squamous cell cancer), may be a threat to life. They can grow back even after the removal. They have the tendency to invade and damage nearby organs and tissues and thus may spread to other parts of the body. The very top layer of the skin contains three different types of cells, basal cell cancer, squamous cell cancer and melanocyte. These cells can become cancerous, so the skin cancer can be mainly divided into three categories:

- Basal Cell Skin Cancer
- Squamous Cell Skin Cancer
- Melanoma

Figure 1.3 shows layers of Skin, i.e. the Epidermis and Dermis (At the top, of the close up shows a squamous cell, basal cell, and melanocyte)

**Basal Cell Carcinoma (BCC)**

This is the most common and the least dangerous skin cancer. It appears as a lump or scaly area and it can be red, pale or pearly in the colour. It grows slowly usually on the head, neck, near the eye or upper torso and can become ulcerated as it grows.

**Squamous Cell Carcinoma (SCC)**

The Squamous Cell Carcinoma cancer grows over a period of weeks or months and may spread to other parts of the body if not treated promptly. It occurs most often (but not only) on all areas exposed to the sun. This can include in the head, neck, handstand forearms.

**Melanoma**

Melanoma begins in the melanocytes (pigment cells). Most melanocytes are in the skin so Melanoma can often occur on any skin surface. In men, it is often found on the skin of the head, neck or between the shoulders and the hips. In women, it is often found on the skin on the lower legs or between the shoulders and the hips. Melanoma is rare in people with dark skin, and for them it is usually found under the fingernails, under the toenails, on the palms of the hands, or on the soles of the feet. Melanoma appears as a new spot or as an existing spot, freckle or mole that changes colour, size or shape with time. It usually has an irregular, smudgy outline and has been more than one colour.

If the biopsy happens to show melanoma, the pathologist will measure the depth of invasion and determine whether the excision removed all of the cancer. Once melanoma has infiltrated to a certain level of the skin will need a more extensive workup.Doctor will look for nearby lymph nodes where cancer may have spread (using a sentinel lymph node biopsy) or a PET or CT scan to look for metastases. Metastatic melanoma requires systemic treatment. So it is difficult to find whether it may affect by cancerous or non – cancerous on seeing the skin image. Many techniques are used to find the melanoma or non-melanoma, where this proposed technique is used to classify the skin cancer through SVM.

# 4. SYSTEM DESIGN AND DEVELOPMENT

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. Systems design is therefore the process of defining and developing systems to satisfy the specified requirements of the user. Figure 3.1 demonstrates the system architecture in detail.

## 3.1 FORM DESIGN

Forms are on screen arrangement that makes it easy to enter and read data. We can also print the forms if we want to. We can design form our self, or let the access auto form feature. System design is a "how to" approach to creation of a new system. System design goes through two phases. They are

- Logical Design
- Physical Design

Logical design reviews the present physical system, prepares input and output specification, makes edit security and control specification.Physical design maps out the detail of the physical system, plans, system implementation, device a test and implementation.

## 3.2 INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy.

Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

## 3.3 OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

## 3.4 DATABASE DESIGN

Database design is the process of producing a detailed data model of a database. This data model contains all the needed logical and physical design choices and physical storage parameters needed to generate a design in a data definition language, which can then be used to create a database. A fully attributed data model contains detailed attributes for each entity.The term database design can be used to describe many different parts of the design of an overall database system. Principally, and most correctly, it can be thought of as the logical design of the base data structures used to store the data. In the relational model these are the tables and views. In an object database the entities and relationships map directly to object classes and named relationships.

The process of doing database design generally consists of a number of steps which will be carried out by the database designer. Usually, the designer must: Determine the data to be stored in the database, determine the relationships between the different data elements. Superimpose a logical structure upon the data on the basis of these relationships.

## SYSTEM DEVELOPMENT

### DESCRIPTION OF MODULES

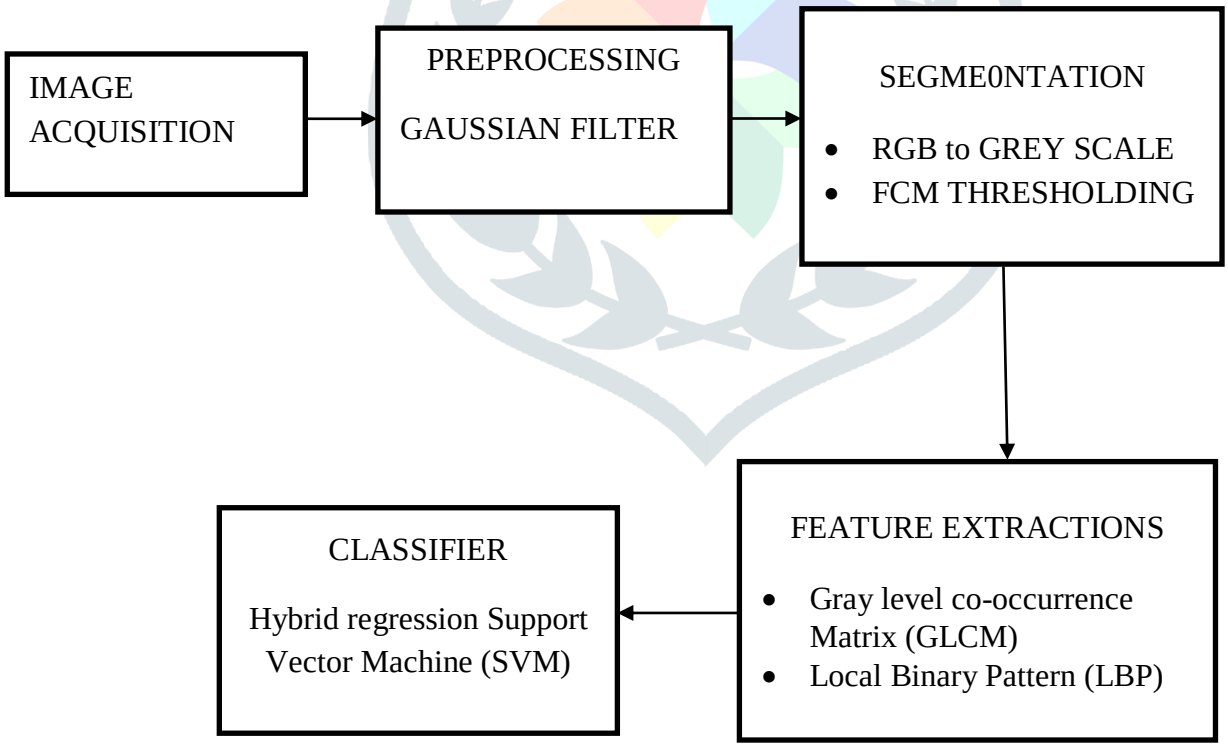
Skin cancer is a deadly disease. Skin has three basic layers. Skin cancer begins in outermost layer, which is made up of first layer squamous cells, second layer basal cells, and innermost or third layer melanocytes cell. Squamous cell and basal cell are sometimes called non-melanoma cancers. Non-melanoma skin cancer always responds to treatment and rarely spreads to other skin tissues. Melanoma is more dangerous than most other types of skin cancer. If it is not detected at beginning stage, it is quickly invade nearby tissues and spread to other parts of the body. The proposed methodology aims to model disease detection/classification and a promising disease grading system for pomegranate patient Skin images. The system makes use of various image processing techniques. The proposed work is mainly divided into four Modules:

- Preprocessing and data acquisition
- segmentation
- feature extraction

- classification

Finally, treatment advisory module is built to make it as a kiosk for the patient for proper control and management of pomegranate eye. Formal diagnosis method to skin cancer detection is Biopsy method. A biopsy is a method to remove a piece of tissue or a sample of cells from patient body so that it can be analysed in a laboratory. It is uncomfortable method. Biopsy Method is time consuming for patient as well as doctor because it takes lot of time for testing. Biopsy is done by removing skin tissues (skin cells) and that sample undergoes series of laboratory testing. There is possibility of spreading of disease into other part of body. It is more risky. Considering all the cases mentioned above, So Skin cancer detection using SVM is proposed. This methodology uses digital image processing technique and SVM for classification. This technique has inspired the early detection of skin cancers, and requires no oil to be applied to your skin to achieve clear sharp images of your moles. In this way, it's quicker and cleaner approach. But, most importantly, due to its higher magnification, Skin Cancer Detection Using SVM can prevent the unnecessary excision of perfectly harmless moles and skin lesions.

## Block Diagram:




Proposed system block diagram

### Pre-processing

In order to improve the accuracy of feature extraction, eight different pre-processing algorithms were used. The algorithms used were converting to grey scale image, sharpening filter, median filter,

smooth filter, binary mask, and RGB extraction, and histogram and sobel operator. The RGB values of the images are extracted before converting it into a gray scale image. Sharpening filter is applied to the gray scale image in order to sharpen the details of the infected region and for segmentation use FCM (Fuzzy clustering means). The number of components of the skin affliction was extracted from the image using GLCM and LBP methods. So classifier is used to detect melanoma or non-melanoma by Support Vector Machine (SVM).

Most of the denoising solutions focuses on noise removal and ignore the edge and contrast details. Some methods apply separate algorithms for each of these three steps. This study proposes a single procedure that simultaneously performs these three operations using an amalgamation of image processing techniques.

**Segmentation**

Segmentation is one of the important steps in cancer detection. The aim of segmentation process is to divide the image into homogeneous, self-consistent regions, which should correspond to different objects in the scene. The process is achieved using only properties of image. The properties are edges and texture are useful for segmentation. Image segmentation is the process of partitioning an image into groups of pixels which are homogenous with respect to some criterion. Segmentation is concerned with dividing an image into meaningful regions. Fuzzy C-Means (FCM) is the commonly models used in clustering set of data. In FCM algorithm the distance from each point to the cluster center will be determined and according to that distance the members will be assigns, it is inverse relation. In this method the single data point may be assign to more than one group with specific membership grade. Often this method is used in pattern recognition. FCM clustering is used to partition N objects into C classes. In our method, N is equal to the number of pixelsin the image i.e. $N=N_x \times N_y$ and C=3 for 3-class FCM clustering.

**Feature Extraction and Selection**

In this research, we aim to propose an intelligent automated method for identification of the type of skin lesions using machine-learning techniques. Two types of texture feature have been used to perform classification of melanoma and non-melanoma. First local information through Local Binary Pattern (LBP) on different scales and Gray Level Co-Occurrence Matrix (GLCM) at different angles has been extracted as a texture features. These features are robust due to scale invariant property of LBP and rotation invariant property of GLCM features. Global information of different colors channels has been incorporated through four different moments extracted in various different color spaces like RGB, HSV etc., Experiments have been tested on well-known dataset dermis that is freely available on the Internet. The proposed method has been compared with state of the art methods and shows better performance in comparison to the existing methods.

**Classification**

Support vector machines (SVMs) area machine learning paradigm based on statistical learning theory. Performances on par with or exceeding that of other machine learning algorithms have been reported in the medical literature. Algorithmically, support vector machines build optimal separating boundaries between data sets by solving a constrained quadratic optimization problem. While the basic training algorithm can only construct linear separators, different kernel functions (i.e., linear, polynomial, radial basis function, and sigmoid) can be used to include varying degrees of nonlinearity and flexibility in the model

# 6. TESTING AND IMPLEMENTATION

## SYSTEM TESTING

System testing is a level of testing that validates the complete and fully integrated software product. The purpose of a system test is to evaluate the end-to-end system specifications. Usually, the software is only one element of a larger computer-based system. Ultimately, the software is interfaced with other software/hardware systems. System testing is actually a series of different tests whose sole purpose is to exercise the full computer-based system.

## UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

## VALIDATING TESTING

The process of evaluating software during the development process or at the end of the development process to determine whether it satisfies specified business requirements. Validation Testing ensures that the product actually meets the client's needs. It can also be defined as to demonstrate that the product fulfills its intended use when deployed on appropriate environment. It answers to the question, Are we building the right product.

**OUTPUT TESTING**

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

## Implementation

The program is written and complied by using MATLAB software and the various modules are successfully executed. The presence of human skin lesions is identified and diagnosed earlier. Most images are affected to some extent by noise that is unexplained variation in data: disturbances in image intensity which are either uninterpretable or not of interest. Image analysis is often simplified if this noise can be filtered out. In an analogous way filters are used in chemistry to free liquids from suspended impurities by passing them through a layer of sand or charcoal. Engineers working in signal processing have extended the meaning of the term filter to include operations which accentuate features of interest in data. Employing this broader definition, image filters may be used to emphasise edges that is, boundaries between objects or parts of objects in images. Filters provide an aid to visual interpretation of images, and can also be used as a precursor to further digital processing, such as segmentation.

In image processing, segmentation is often the first step to pre-process images to extract objects of interest for further analysis. Segmentation techniques can be generally -categorized into two frameworks, edge-based and region based approaches. As a segmentation technique, FCM method is widely used in pattern recognition, document binarization, and computer vision. In many cases FCM method is used as a pre-processing technique to segment an image for further processing such as feature analysis and quantification. Clustering techniques partition the data into several groups such that the degree of association is strong within one group and weak between data in different groups. Fuzzy clustering by contrast allows data points to belong to more than one group. The resulting partition is therefore a fuzzy partition. Each cluster is associated with a membership function that expresses the degree to which individual data points belong to the cluster.

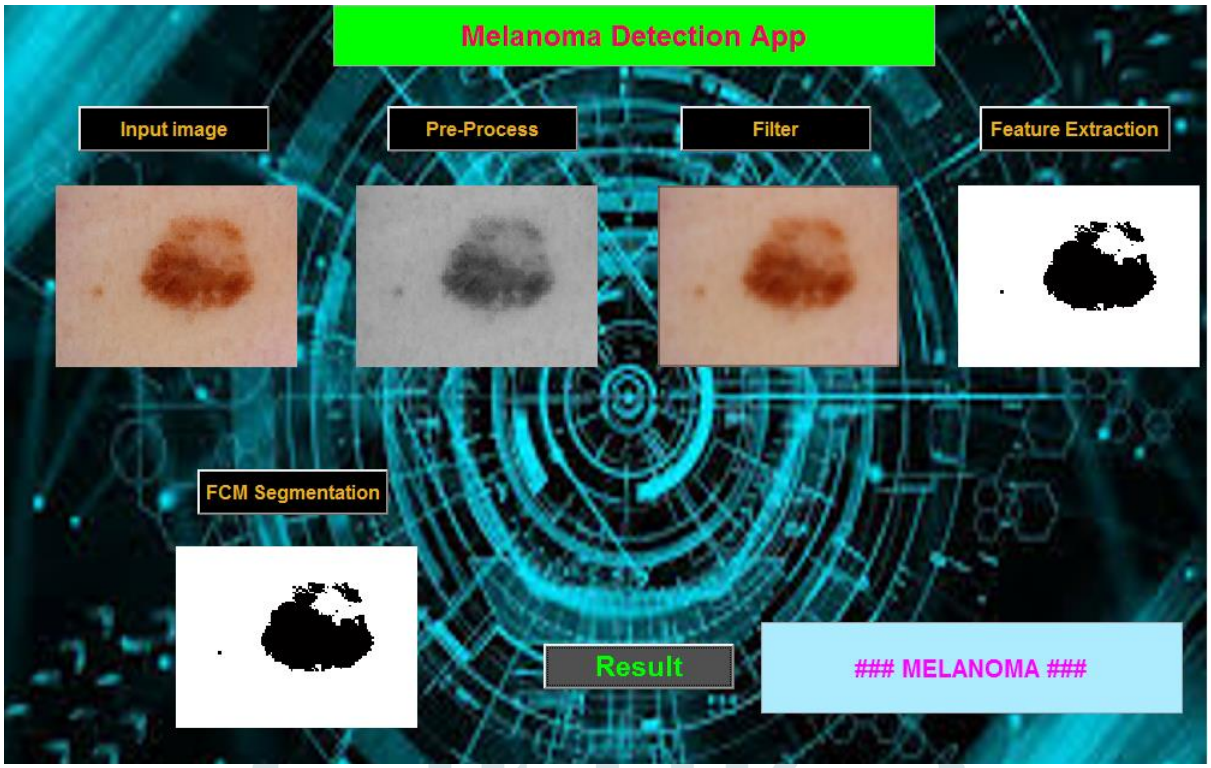



Figure 3 input video data selection

**The output feature values various images of Feature Extraction values are given below**

| S.no | Contrast | Correlation | Energy | Homogeneity |
|---|---|---|---|---|
| 1. | 0.180 | 0.968 | 0.492 | 0.932 |
| 2. | 0.093 | 0.927 | 0.480 | 0.953 |
| 3. | 0.149 | 0.920 | 0.440 | 0.926 |
| 4. | 0.137 | 0.941 | 0.487 | 0.937 |
| 5. | 0.178 | 0.959 | 0.272 | 0.913 |
| 6. | 0.137 | 0.836 | 0.419 | 0.931 |
| 7. | 0.184 | 0.886 | 0.274 | 0.908 |
| 8. | 0.208 | 0.953 | 0.201 | 0.902 |
| 9. | 0.237 | 0.920 | 0.348 | 0.886 |
| 10. | 0.237 | 0.934 | 0.380 | 0.894 |
| 11. | 0.131 | 0.940 | 0.315 | 0.934 |
| 12. | 0.137 | 0.948 | 0.356 | 0.939 |
| 13. | 0.180 | 0.968 | 0.492 | 0.932 |
| 14. | 0.371 | 0.905 | 0.173 | 0.853 |
| 15. | 0.099 | 0.782 | 0.713 | 0.952 |
| 16. | 0.251 | 0.879 | 0.228 | 0.877 |
| 17. | 0.208 | 0.952 | 0.316 | 0.917 |

# CHAPTER 7

# 7 CONCLUSIONS

The segmentation method presented in this paper is one of the flexibly methods for segmentation. Thresholding segmentation is useful technique for establishing boundaries in image. Fuzzy C-Means segmentation is comparatively moreclear than thresholding segmentation. The results obtained in segmentation images are taken by national cancer institute. In this case also we find infected area.Cancerous region is separated from healthy skin by the method of segmentation. The unique features of the segmented images were extracted using GLCM. Based on the features, the image can be classified.

In this research, proposed a feature extraction technique for classification of dermoscopic images into melanoma and non-melanoma. Two types of features have been used, color and texture. For texture features, GLCM and LBP have been used. Combining these features improves the accuracy of the classification results. In this way, proposed technique has been able to better classify dermoscopic images into Melanoma and Non-Melanoma groups. In order to evaluate the usefulness and performance of proposed model, experimentation is performed on standard dataset of dermIS. The experiments showed good results for the proposed methodology. Both GLCM can increase classification performance when combined with a large set of LBP features, qualitative and quantitative error measures are used to assess the system performance.

# CHAPTER 8

# 8 FUTURE SCOPES AND ENHANCEMENT

As a future work of this project comprises classifiers support vector machine (SVM) approaches for training classifiers based on several functions like polynomial functions, radial basis functions, neural networks etc., The SVM classifier are applied on the statistical texture features to predict the malignancy of the skin lesion. Each skin image in test set is classified by comparing it against the skin images in the training set. The training set consists of both normal and cancer skin images and skin disease images.

The comparison is performed using the local features obtained in the previous step. SVMs have several advantages over the more classical classifiers such as decision trees and neural networks and also Fuzzy clustering approaches are used for training classifiers to predict the skin lesion with accuracy.

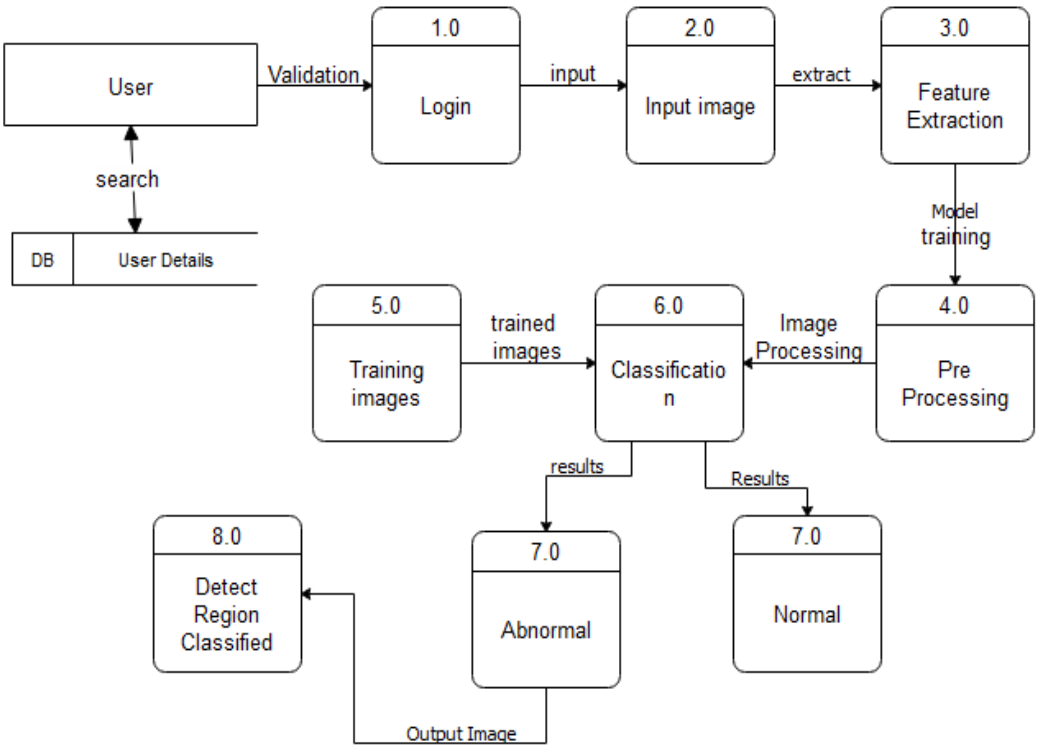
**Bibliography**


1. Cheng Lu, Muhammad Mahmood , Naresh Jha, Mrinal Manda (2013)., 'Detection of melanocytes in skin histopathological images using radial line scanning', Journal of the Pattern Recognition, Elsevier, pp.46, 509–518.
2. Mahmoud Elgamal Institute of Hajii and umra., Um Alqura Uni (2013) 'Automatic Skin Cancer Images Classification', International Journal of Advanced Computer Science and Applications,Vol. 4, No. 3.
3. Agata Tymińska, Mirosława Cichorek, Małgorzata Wachulska, Aneta Stasiewicz, (2013), 'Skin melanocytes: biology and development', Vol. XXX, No.1 PP:30-41.
4. Farshad Tajeripour, Shervan Fekri-Ershad, Mohammad Saberi, (2012)'An Innovative Skin Detection Approach Using Color Based Image Retrieval Technique','The International Journal of Multimedia & Its Applications (IJMA) Vol.4, No.3.
5. P.V.Arivoli, E.Kaveri, T.Chakravarthy, (2015),'A survey on Segmentation and Classification Approach for Skin Medical Image' International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 13 pp.33504-33509 © Research India Publications.
6. Asadollah Shahbahrami, Reza Hassanpour Stephan Wong (2008), 'Adaptive Gaussian Mixture Model for Skin Color Segmentation', Proceedings of World Academy Of Science, Engineering and Technology, Vol.31, pp.1307-6884.
7. Cheng Lu,Mahmood, M. Jha, N., Mandal, M (2013), 'Automated Segmentation of the Melanocytes in Skin Histopathological Images', Journal of Biomedical and Health Informatics, IEEE, Vol.17, Issue. 2,pp. 284 – 296.
8. Abhishek Mishra, Anurag Verma, 'Image Compression using Gaussian Smoothing Filter and Median Filter' International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 3 Issue: 11 PP.6344 – 6347
9. Chanchal Srivastava1, Saurabh Kumar Mishra2 (Mar - Apr 2013), et all 'Performance Comparison of Various Filters and Wavelet Transform for Image De-Noising' IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p- ISSN: 2278-8727Volume 10, Issue 1, PP. 55-63
10. Suresh Kumar, Papendra Kumar, Manoj Gupta, Ashok Kumar (2010), 'Performance Comparison of Median and Wiener Filter in Image De-noising', International Journal of Computer Application, Vol.12 – No.4.

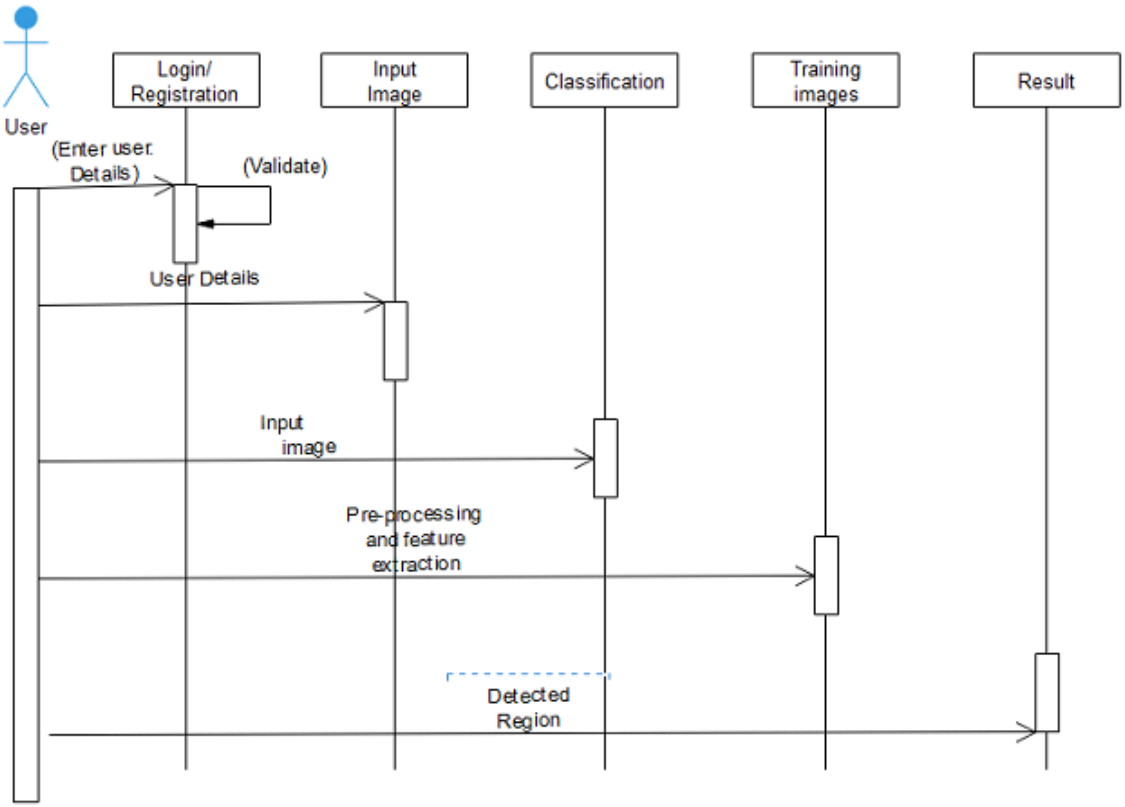
11. Robert S. Porter, & D. L. Kasper, E. Braunwald, and A. Fauci (2011) 'The Merck Manual', 'Harrison's Principles of Internal Medicine', 17th ed., McGraw-Hill, New York.

12. R. Anderson, A. Parrish (1981), 'The optics of human skin, The Journal of Investigative Dermatology, Vol. 77, PP 13-19.

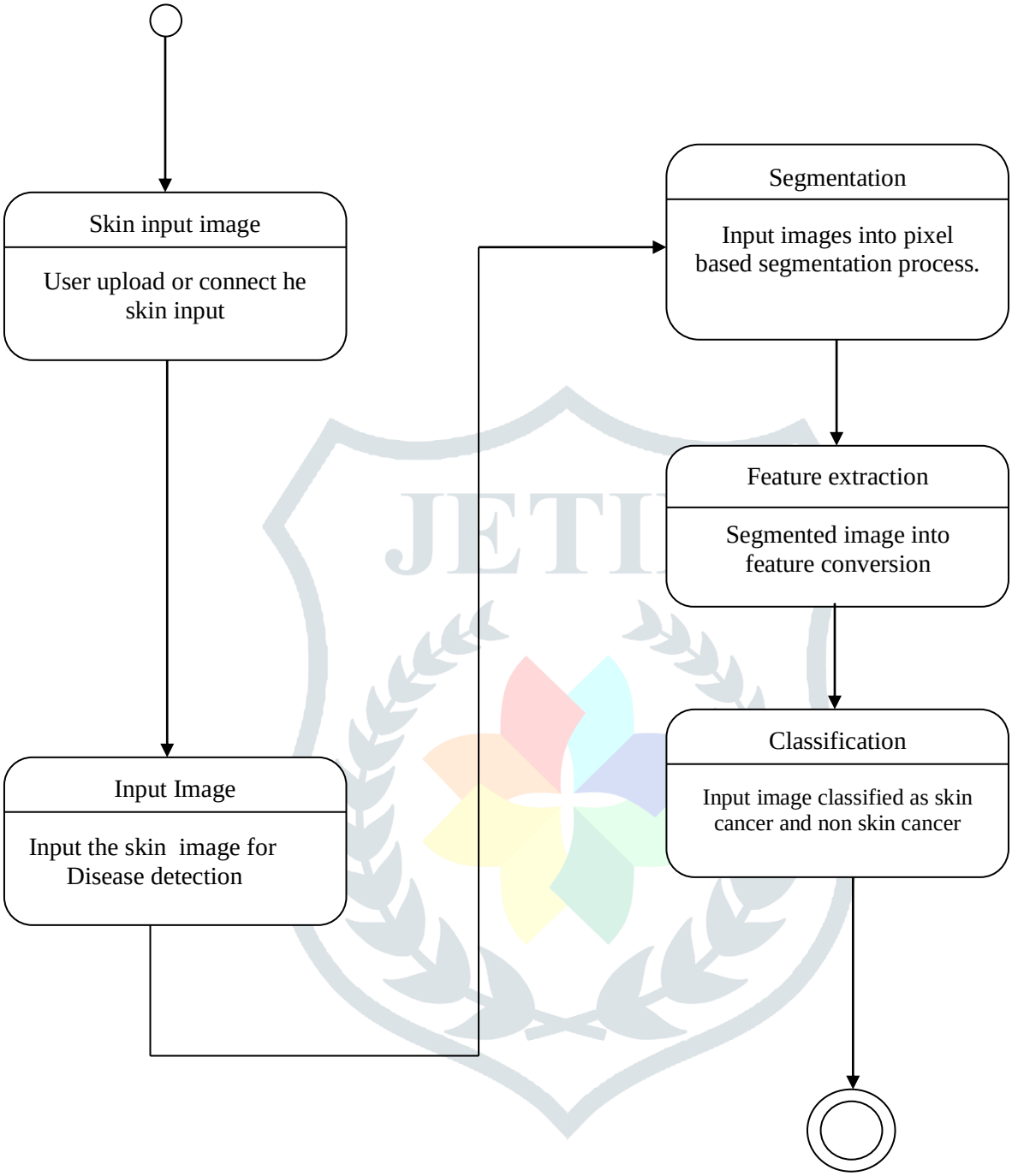
# DATA FLOW DIAGRAM



## C. SEQUENCE DIAGRAM



# State Chart Diagram



# A.SAMPLE CODE

**Mat lab Coding**

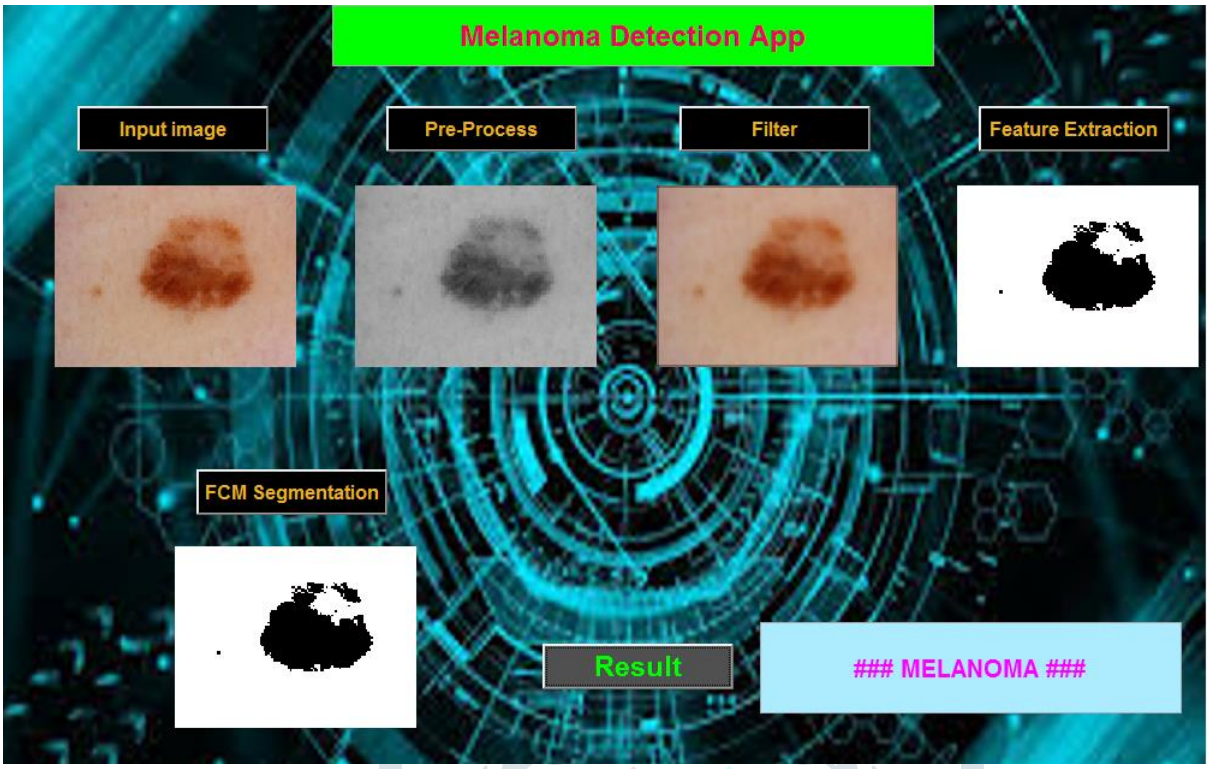
```
function varargout = menaoma(varargin)
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @menaoma_OpeningFcn, ...
                   'gui_OutputFcn',  @menaoma_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end


if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
handles.output = hObject;
guidata(hObject, handles);
function varargout = menaoma_OutputFcn(hObject, eventdata, handles)
varargout{1} = handles.output;
[a b]=uigetfile('*.*');
c=strcat(b,a);
d=imread(c);
axes(handles.axes1);
imshow(d);
global d e
e=rgb2gray(d);
axes(handles.axes2);
imshow(e);
function pushbutton3_Callback(hObject, eventdata, handles)
global d f
f = fspecial('average');
f= imfilter(d,f);
axes(handles.axes3);
```

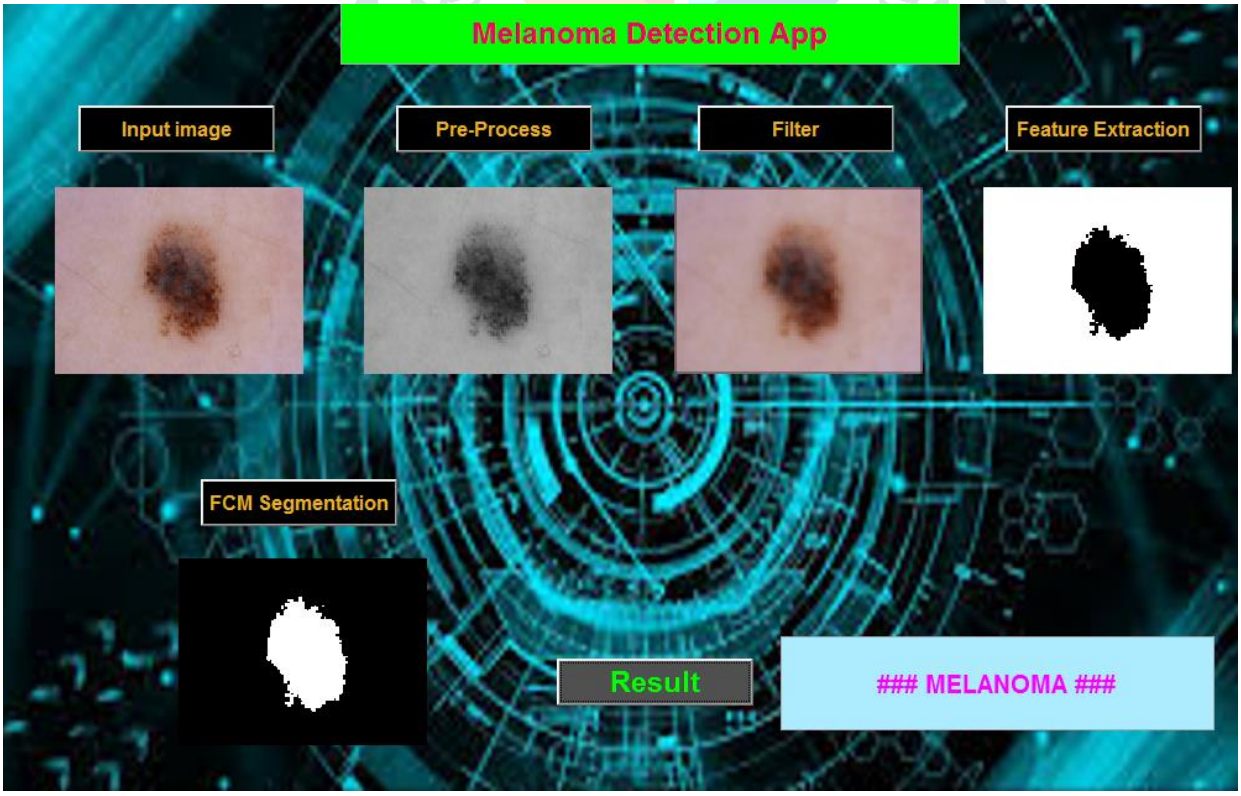
```
imshow(f);
function pushbutton4_Callback(hObject, eventdata, handles)
global e g d
GLCM2 = graycomatrix(e,'Offset',[2 0;0 2]);
stats = graycoprops(GLCM2,'all');
x1 = stats.Correlation(1);
disp(x1);
set(handles.edit8,'String',x1);
x2 = stats.Energy(1);
disp(x2);
set(handles.edit10,'String',x2);
x3 = stats.Contrast(1);
disp(x3);
set(handles.edit7,'String',x3);
x4=stats.Homogeneity(1);
disp(x4);
set(handles.edit9,'String',x4);
g=im2bw(d);
axes(handles.axes4);
imshow(g);
function pushbutton5_Callback(hObject, eventdata, handles)
global g img h d c1 c2
h=d;
img = double(g);
clusterNum = 2;
[ Unow, center, now_obj_fcn ] = FCMforImage( img, clusterNum );
axes(handles.axes5);
imshow(img,[]);
for i=1:clusterNum
    %subplot(2,2,i+1);
    imshow(Unow(:,:,i),[]);
end
function pushbutton6_Callback(hObject, eventdata, handles)
global c1 c2 h
c1 = recog1(h);
 c2 = recog2(h);
if c1 == 1
 disp('MELANOMA');
```

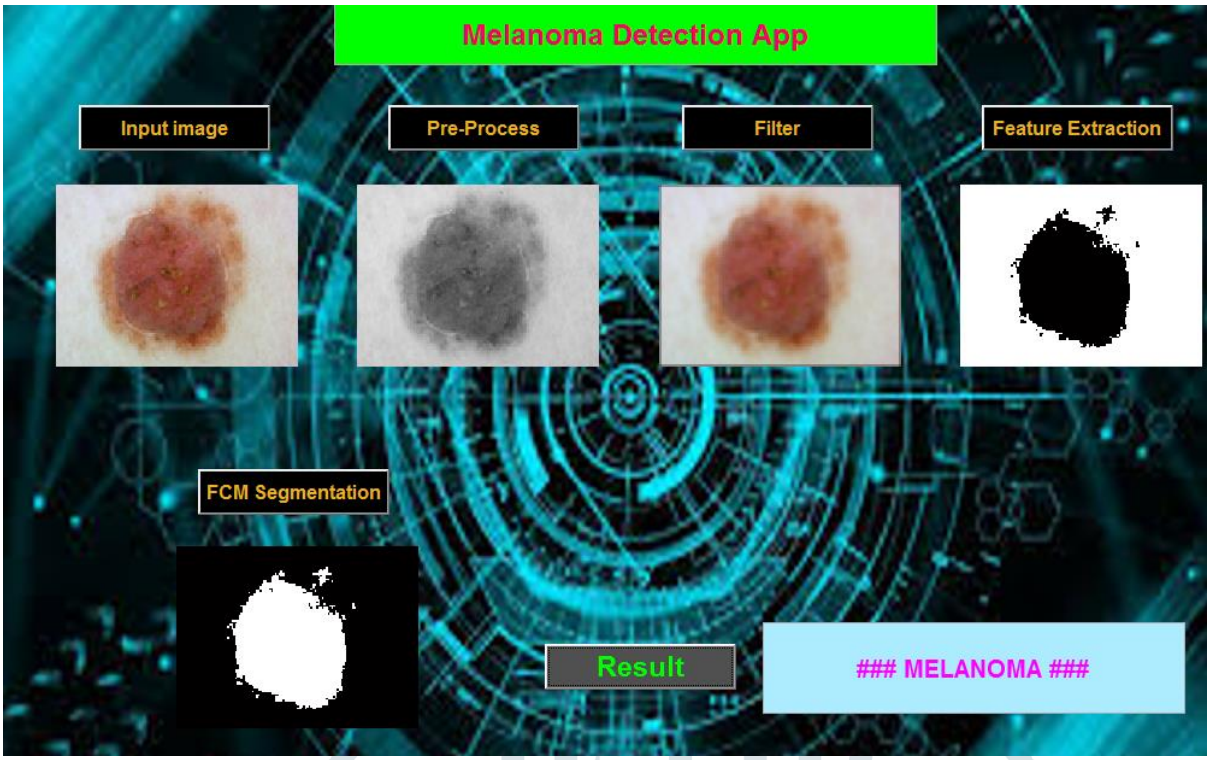
```
 set(handles.edit2,'String','### MELANOMA ###');
end
if c2 == 1
disp('NON_MELANOMA');
set(handles.edit2,'String','*** NON_MELANOMA ***');
end
function edit2_Callback(hObject, eventdata, handles)
function edit2_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit3_Callback(hObject, eventdata, handles)
function edit3_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit4_Callback(hObject, eventdata, handles)
function edit4_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit5_Callback(hObject, eventdata, handles)
function edit5_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit6_Callback(hObject, eventdata, handles)
function edit6_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit7_Callback(hObject, eventdata, handles)
function edit7_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit8_Callback(hObject, eventdata, handles)
function edit8_CreateFcn(hObject, eventdata, handles)
```

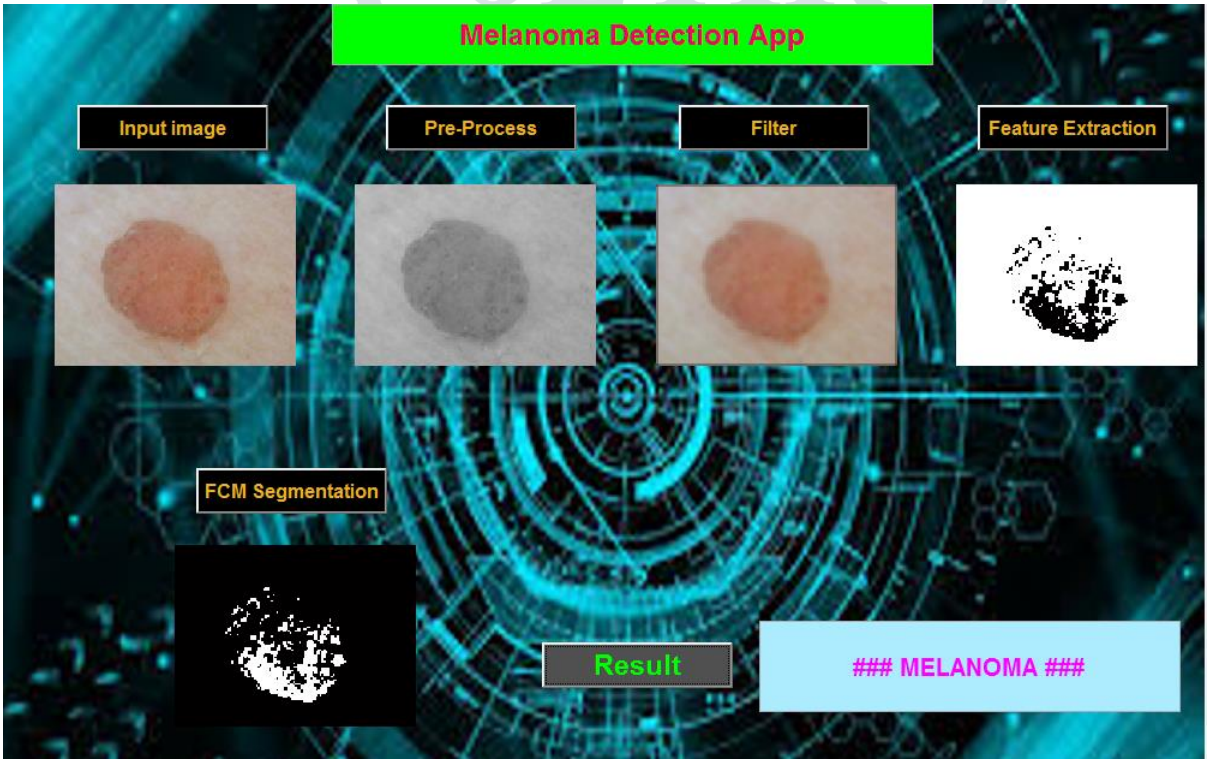
```
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit9_Callback(hObject, eventdata, handles)
function edit9_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit10_Callback(hObject, eventdata, handles)
function edit10_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit11_Callback(hObject, eventdata, handles)
function edit11_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function edit12_Callback(hObject, eventdata, handles)
function edit12_CreateFcn(hObject, eventdata, handles)
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function axes7_CreateFcn(hObject, eventdata, handles)
function axes6_CreateFcn(hObject, eventdata, handles)
function axes8_CreateFcn(hObject, eventdata, handles)
a1=imread('9.jpg');
a1=imresize(a1,[1750 2550]);
imshow(a1);
b1=imread('5.jpg');
b1=imresize(b1,[1050 500]);
imshow(b1);
```

## B.SCREEN SHOT




Melanoma Detection App
Input image
Pre-Process
Filter
Feature Extraction
FCM Segmentation
Result
### MELANOMA ###


Melanoma Detection App
Input image
Pre-Process
Filter
Feature Extraction
FCM Segmentation
Result
### MELANOMA ###