

# Robotizing Skin Diseases Diagnosis Using Image Classification

S. Sree Hari Raju\*, Pedakolmi Venkateswarlu\*\* and M. Shankar Lingam\*\*\*

## ABSTRACT

There have been numerous endeavors to actualize customary telemedicine over the world particularly in the creating nations, however the endeavors has been portrayed with difficulties, for example, high-cost of maintaining telemedicine arrangements and non-accessibility of medicinal mastery. Malignant Skin malady, for example, melanoma and nevi ordinarily comes about because of ecological components, (for example, presentation to daylight) among different causes. The essential instruments required for early discovery of these sicknesses are still not a reality in most African people group. As of late, there have been elevated standards for strategies, for example, Dermoscopy or Epiluminiscence Light Microscopy (ELM) in supporting conclusion; however assessment of pigmented skin injuries utilizing ELM is not just non-moderate by the majority of African people group additionally mind boggling and exceedingly subjective, in this manner rousing looks into in determination robotization. This study would concentrate on planning and demonstrating a framework that will gather past Pigmented Skin Lesion (PSL) picture comes about, their investigation, comparing perceptions and conclusions by restorative specialists utilizing prototyping philosophy. These abundance of data would be utilized as a library. A part of the framework would utilize computational knowledge method to dissect, handle, and arrange the picture library information in light of surface and perhaps morphological components of the pictures. Prepared restorative faculty in a remote area can utilize portable information obtaining gadgets, (for example, mobile phone) to create pictures of PSL, supply such pictures as contribution to the proposed framework, which in turns ought to wisely have the capacity to determine the harm (life-debilitating) or generous (non-undermining) status of the imaged PSL.

**Keywords:** robotized conclusion, computational knowledge, medicinal imaging, remote wellbeing finding, skin sickness

## 1. INTRODUCTION

Medicinal Imaging give systems and procedures in making pictures of human body or tests, (for example, blood or sputum) for clinical purposes - (restorative techniques trying to uncover, analyze or look at sickness), therapeutic science - (investigation of typical life systems and physiology) or for learning disclosure. Advanced picture preparing includes the screening of a locale for handling and sparing this area to an area (perhaps a record) for preparing utilizing operations, for example, fractal and surface examination.

A Fractal is a question that actually shows self-similitude on all scales; with the end goal that regardless of the possibility that the protest does not display the very same structure at all scales, it would have same sort of structures showing up on all scales (Mathworld, 2012). Fractal Dimension is a proportion that gives a factual record of multifaceted nature contrasting how subtle elements in a fractal design changes with the scale at which it is measured, for example, given by relationship between a question's length (or zone) and its distance across. In medicinal imaging, Fractal examination commonly decides the fractal measurement of a picture utilizing systems, for example, worldwide box-numbering, fractal measurement, mean fractal

\* HOD, Dept. of Computer Science Nagole Institute of Technology & Science (NITS), Hyderabad, Email: rvs2raju@gmail.com

\*\* Dean, Department of Computer Science Nagole Institute of Technology & Science (NITS), Hyderabad, Email: venkat123.pedakolmi@gmail.com

\*\*\* Research Scholar, BIMS, University of Mysore, Mysore, Email: shankumacharla@gmail.com

measurement, and nearby associated fractal measurement for double edge utilized amid investigation of a picture. Surface investigation then again utilizes techniques, for example, co-event lattices analytics; assessment of surface components, (for example, vitality, entropy, complexity and relationship amid picture preparing).

The significant point of picture investigation is to utilize picture handling strategies to give a machine translation of a picture, regularly in an organization that could encourage basic leadership prepare. In the previous two decades, solid drive has been given to creating robotized frameworks equipped for helping doctors in restorative imaging undertaking (Dobrescu et al., 2010). In any case, the nearness of commotion, covering structures, fluctuation of organic shapes and tissues, imaging framework anisotropy etcetera making the computerized examination of restorative pictures a hard assignment (Rubegni et al., 2002; Stanganelli et al., 2005; Dobrescu et al., 2010). The skin's surface is a definite scene, with complex geometry and neighborhood optical properties. Skin highlights relies on upon numerous variable, for example, body area, (for example, brow or cheek), subject parameters, (for example, age or sexual orientation), and imaging parameters, (for example, lighting or camera, furthermore the heading from which it is seen and lit up). Bacterial and viral skin contaminations for the most part influence the skin by decolorizing and bending pigmented skin zones, assist making mechanization of medicinal picture examination troublesome (Tushabe et al., 2011).

One of the best ways to deal with overcome previously mentioned challenges in mechanizing therapeutic imaging determination is to disentangle the goal of the examination and to endeavor some sort of speculative data about the imaged structures. The data about the structures to be examined can be anatomical learning about their run of the mill appearance, (for example, shape and dark levels) and position; or measurable information of their properties, (for example, dim level of the tissues incorporated into those structures). The pictures can then be grouped utilizing their morphological, shading, fractal, and surface properties.

Laws, 1980 in his work changed advanced pictures to distinguish districts of intrigue and gave an information dataset to division and elements identification operation. The creator utilized operations, for example, thresholding, morphological examination and surface discovery to isolate advanced picture into individual articles to play out a different investigation of every area. The occurrence of skin disease is quickly expanding all through the world and it is progressively getting to be one of the overwhelming types of malignancy particularly in Caucasian populace nations and among reasonable cleaned individuals (Snober et al., 2001; Han et al., 2006; Ali and Deserno, 2012). Skin disease occurrence is on the request of 10 to 12 in Europe, 18 to 20 in United States, and 30 to 40 in Australia for every 100000 subjects (Schmid-Saugeona et al., 2003).

Throughout the years, it is been accounted for that Automatic Data Analysis utilized for Melanoma (a kind of skin growth) demonstrated a higher symptomatic execution contrasted with doctors perception as far as affectability (extent of genuine positives), however bring down as far as specificity (extent of genuine negatives). A typical method utilized for previously mentioned robotized information examination is Dermoscopy or Epiluminescence Light Microscopy (ELM), an in-vivo, non-obtrusive strategy that lately has uncovered another measurement of the clinical morphological components of Pigmented Skin Lesion (PSL) utilizing diverse light amplification frameworks with oil submersion procedure (Ali and Deserno, 2012). Dermoscopy or its synonymous Dermatoscopy gives dermatologist with a procedure to in-vivo examination of PSL and it renders higher exactness for recognizing suspicious cases than it is conceivable with well-known routine of stripped eye review (Kittler, 2004).

Curiously, while value of therapeutic imaging is getting well known, World Health Organization reported in one of their discoveries that three quarter of whole total populace is yet to have admittance to medicinal imaging which is a fundamental procedure in new age telemedicine, for example, in robotization of skin sickness analysis (WHO, 2007). In this way, restorative imaging has contributed monstrously towards

propelling medicinal methodology. The way that translation and investigation of therapeutic imaging results are still vigorously reliant on restorative specialists (whose accessibility are low or non-presence) is a genuine sympathy toward creating and underserved districts (particularly provincial settings). An approach is expected to minimize this reliance furthermore to point of confinement plausible inclination of medicinal faculty in the investigation of a restorative picture result, thus this specific study.

## 2. ISSUE STATEMENT

The specialists regularly have accepted conclusion sentiment, which no doubt start via hunting down additional confirmation that their supposition can be approved and in situations where it is not approved, they will have missed other potential analysis. Predisposition basically impacts investigation made by restorative professionals, pretty much as with any human hunt that starts with catchphrases picked by the client. Also, if a specialist starts looking by side effects, while this might be exact, the request or weight given to any of the side effects would in all probability give an inclination towards related conclusion when truth be told, there might be a manifestation that is not given any credit and subsequently excluded in the inquiry or considered in convenient mold.

The substantial conditions on medicinal master for therapeutic picture determination investigation are a genuine test for districts (particularly Low and Medium Income Countries) where the master won't not be promptly accessible, lacking or non-receptive to a dire restorative need, (for example, dermatological-related). The previously mentioned issues recommend that a superior and sensible arrangement is required direly with the view to minimize these conditions and human inclination, subsequently prompting to our exploration address.

## 3. INQUIRE ABOUT FOCUS

In light of finding of Han et al., 2006, the rate of skin malignancy is quickly expanding all through the world and it is bit by bit getting to be one of the prevalent types of tumor particularly in Caucasian populace nations and among reasonable cleaned individuals. Skin disease occurrence is on the request of 10 to 12 in Europe, 18 to 20 in United States, and 30 to 40 in Australia for every 100000 subjects (Schmid-Saugeona et al., 2003; Stanganelli et al., 2005; Ali and Deserno, 2012). This examination is propelled by the requirement for studies that can give ways or methodologies that can be utilized by therapeutic experts, (for example, Dermatologist) and in the meantime not intensely reliant on assessments of the Dermatologist (which can frequently be subjective as reported by Rubegni et al., 2002; Stanganelli et al., 2005).

The essential research question is by what method would we be able to minimize the substantial conditions on restorative specialists for finding methodology of Pigmented Skin Lesions (PSL) in patients dwelling in remote or underserved regions?

This question could be positively addressed if accentuation is set on zones underneath:

- I. Bickers et al., 2004 uncovered that medicinal services cost for ailments, for example, melanoma found the middle value of at about \$39.3 billion in 2004. To give a convenient modest arrangement, what gadgets or devices are effortlessly open or effectively claimed by a great many people living in underserved zones that can be utilized as a major aspect of the conclusion apparatus?
- II. What is the best way to deal with institutionalize picture set to accommodate library of past known determination and relating comes about?
- III. For the proposed framework to mechanize the finding procedure, by what means would we be able to arrange restorative pictures utilizing the picture properties, (for example, surface) as either harmful or kind?

- IV. In an offer to enhance the speed of conclusion, in what manner can inclination made by therapeutic specialists, particularly dermatologist be minimized?

#### 4. EXPLORE AIM AND OBJECTIVES

The motivation behind the study is to plan and model a framework that utilizes restorative imaging to lessen overwhelming conditions on medicinal master for conclusion method of PSL (particularly melanoma and nevi) in patients. The exploration would utilize design coordinating calculations to dissect restorative pictures against known qualities.

The examination goals are:

- To build up a calculation for effective extraction and characterization of Pigmented Skin injury, for example, that of melanoma and nevi (along these lines minimizing potential inclinations made by restorative specialists, particularly dermatologist).
- To straightforwardness determination and treatment of skin patient (by method for computerization) and accommodate financially savvy method for treatment (by utilizing gadgets or instruments effectively available or officially controlled by the vast majority living in remote and underserved ranges).
- To enhance the speed of diagnosing Pigmented Skin Lesion, for example, in melanoma and nevi (utilizing ground truth learning of past finding of PSL as restorative picture library).

#### 5. WRITING REVIEW

Mid the most recent couple of years, telemedicine with remote picture survey and investigation has risen as a very profitable and flexible instrument, especially suited to spots where nearby medicinal mastery is constrained. Granot et al., 2008 took a shot at making a medicinal imaging framework comprising of physically isolated parts of therapeutic imaging framework with a specific end goal to deliver a vigorous and less costly framework that can be utilized via prepared non-restorative faculty. Selection of straightforward strategy for microphotography which could fundamentally build openings and quality diagnostics while bringing down expenses and significantly expanding availability between most secluded research facilities and removed reference focus has been proposed by Aher and Kaore, 2010.

Dobrescu et al., 2010 depicted a technique for a calculation for programmed location of threat of skin sore which depends on both nearby fractal highlights (neighborhood fractal measurement) and surface elements got from medium co-event networks, (for example, difference, vitality, and homogeneity). Tushabe et al., 2011 proposed a picture based analysis strategy where pictures of skin issue were utilized to arrange skin illnesses into general classification of either popular tainted or bacterial contaminated. Dangerous melanoma at present records for 33% of most successive sort of skin tumor and 79% of skin disease passing. The frequency of dangerous melanoma in reasonable cleaned patients has expanded theatrically in many parts of the world in the course of recent decades (Rubegni et al., 2002; Stanganelli et al., 2005; Dobrescu et al., 2010). In Europe, it's been accounted for that threatening melanoma frequency is expanding by 5% consistently and it is in charge of 91% of skin growth passing (Sboner et al., 2001; Ali and Deserno, 2012). In an offer to enhancing early discovery, various analytic agendas and standards have been proposed, for example, Seven Point Checklist (HealSmith et al., 1994), and ABCDE: Asymmetry, Border, Color, Diameter, Evolution agenda (Fitzpatrick et al., 1998). These principles and agendas determine visual elements connected with harmful sore manifestations.

Stolz et al., 1994 in their work, built up a conclusion conspire for dermoscopic pictures, getting to the Asymmetry (A), Border (B), Color (C), and Diameter (D) of various picture structures. This ABCD lead turned into the standard in Dermoscopy for organizing PSL into generous, suspicious, or threatening moles

(melanoma). Be that as it may, dermoscopic determination is regularly unpredictable and subjective, in this manner connected with poor reproducibility and low exactness particularly among freshness dermatologist, as the precision of specialists is 65-84% (Argenziano et al., 2003; Lee, 2001, Stanganelli et al., 2005). Additionally, visual elucidations of these components by dermatologist have so far turned out to be a troublesome assignment. Lee 2001 in his study reported discovery rate in view of clinical visual examination to be around 65%.

Melanoma is exceedingly reparable if analyzed early and regarded appropriately as survival rate fluctuates somewhere around 15% and 65% from terminal to early stages separately (Ali and Deserno, 2012). Contingent upon the onlooker's experience, Dermoscopy enhances the analytic exactness for melanoma discovery up to half as contrasted and customary visual review (Kittler, 2004). In the most recent decade, utilization of Dermoscopy or Epiluminiscence Light Microscopy (ELM) changed the dermatologist's way to deal with suspicious PSL. In any case, the investigation made utilizing ELM are to a great degree perplexing and subjective (Rubegni et al., 2002). To forestall previously mentioned test of quantitative elucidation, techniques in view of Computer-Aided Diagnosis (CAD) have been presented towards computerizing the analysis methodology, for example, in Rubegni et al., 2002; Stanganelli et al., 2005; Mitra and Parekh, 2011.

Gilmore et al., 2009 utilized lacunarity (a measure of transitional invariance of a protest utilized as a part of evaluating parts of examples that display scale-subordinate changes in structure) to give a promising technique to robotized appraisal of melanocytic nevi and melanoma. The fluffy based histogram examination system utilized by Stanley et al., 2003 gave a plausibility to robotized skin injury separation in dermatology clinical pictures. Rubegni et al, 2002 built up a computerized procedure utilizing simulated neural system strategies in light of scientific examination of pigmented skin sores to stay away from the issue of subjective translation made by the utilization of ELM by Dermatologist. Kreutz et al., 2000 exhibited a mix of counterfeit neural system approach with surface examination utilizing computerized picture handling and blend of specialists to endeavor computerization of skin disease conclusion. Ganster et al., 2001 built up a framework that accommodated robotized electronic investigation of pictures acquired from ELM to improve the early acknowledgment of threatening melanoma. Sheha et al. 2012 utilized Gray-Level Co-event Matrix (GLCM) and Multilayer perceptron classifier (MLP) for programmed Detection of Melanoma Skin Cancer utilizing Texture Analysis. One center test however with a large portion of previously mentioned methodologies is their powerlessness to incorporate well with omnipresent gadgets, for example, versatile communication, now to a great extent available to underserved ranges (Mobithink, 2012).

## 6. BENEFITS

Perceptible issues in current approach towards PSL determination incorporate the subjective nature in the utilization of dermoscopic finding, its setup cost and its over reliance on restorative master (for this situation, dermatologist) for investigation. This study tends to display a framework that would enhance remote patient finding, screening and examination of skin issue at a decreased cost while diminishing over conditions on therapeutic master. The wellbeing danger inside the rustic groups and developing urban communities can be lessened. It is additionally expected that the yield of the study would bring about a framework that would build the speed of skin illness determination, given that the time slack that could be created by overwhelming reliance on therapeutic master would be enormously diminished. Gaining pictures these days is simple. Most phones can catch great quality pictures. New eras of picture based determination frameworks utilizing computerized advances are progressively been produced (Arani and Ghassemian, 2010; Baldi et al., 2009). Thus, it might be conceivable even with utilization of cell phone which are progressively accessible in Low and Medium Income Countries (Mobithink, 2012) to analyze a skin ailment once the cell phone transfers the caught picture to a server, (for example, associated by means of Virtual Private Network) and right away examination would be done on the picture and pertinent analysis result would be consequently be distributed back to the telephone.

The essential point of this study is to fabricate and show a framework that will exploit every one of these improvements can decrease already specified difficulties amid examination of PSL, which basically would accelerate treatment technique for patients. Probably, the losses of life as a consequence of need or inaccessibility of dermatologist in underserved zones could be to a great extent diminished. We trust the study would in bear future open doors in growing better and minimal effort compelling answers for relieve dermatological difficulties

## 7. INQUIRE ABOUT METHODOLOGY

The technique of this work depends on delicate science outline to understand a model framework for the analysis of skin ailment spoke to by a skin picture. We expect utilizing highlights in view of surface investigation and group the injury utilizing systems, for example, thresholding and neural systems to create and model another calculation for skin sickness determination. Figure 6.1 demonstrates the general precise strides of the propose calculation for skin infection finding. Each critical stride of the calculation is from there on examined.

In an offer to fabricate quick, better and sensible quality framework, we mean utilizing prototyping system. We would have an underlying model that would incorporate program modules, database, info and yield unit that the framework would utilize. We would consistently take a shot at the model by altering, and adding to it to empower us in the long run having a total working framework. The consequent sub-segment uncovers the outline and techniques we expect utilizing.

## 8. LOOK INTO DESIGN AND METHODS

We are regularly taking after a methodology that includes five fundamental strides in preparing the PSL:

- a) Image Formation and Preprocessing (see Fig. I underneath)
- b) Segmentation
- c) Feature Extraction
- d) Classification of the Lesion
- e) Diagnosis Accuracy Assessment

After the securing and preprocessing of shading pictures of the PSL, we expect performing division of the injury perhaps from the encompassing skin (Zagrouba and Barhoumi, 2004). The sore regions and limits would be obviously recognized, and different properties of the injury qualities of the danger or

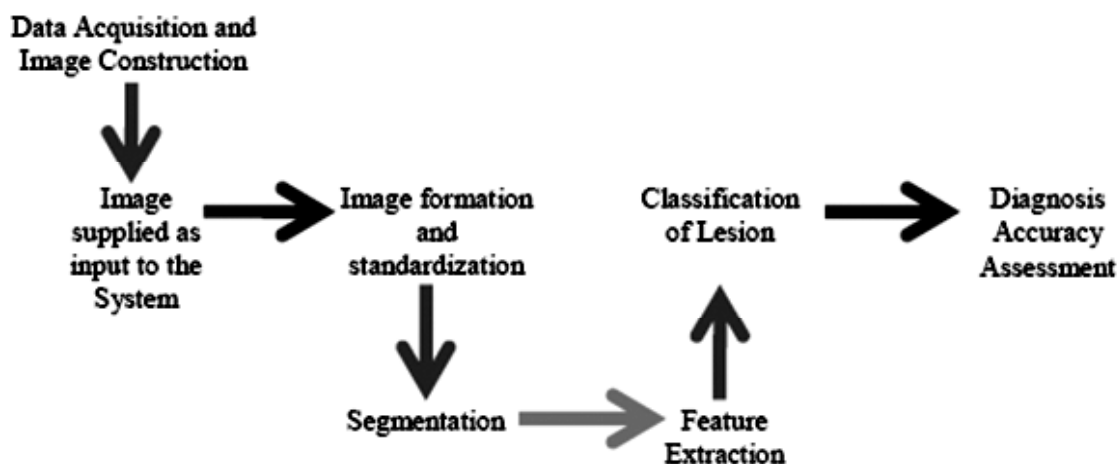


Figure 1: Algorithm Method

considerate side effects would be measured. Such attributes components will then be the crude contribution to an acknowledgment calculation grouping the sore as dangerous melanoma, generous nevi or suspicious mole. Keeping in mind the end goal to have effective arrangement framework, segment 6.1a – 6.1d recognized above would be completed with care. The exactness appraisal would find the affectability and specificity of the study result.

PSL pictures to be utilized would be institutionalized into a picked determination. It is normal that a portion of the pictures to be utilized may have elements, for example, hairs and shades which befuddles investigation. These elements are ordinarily viewed as clamor, and in this way should be sifted off so as to encourage partition of the injury region from the encompassing skin. A strategy known as DullRazor would be beseeched for the middle separating of the clamor as portrayed by Lee et al., 1997(see Fig. 2 & 3).



Figure 2: Original Image

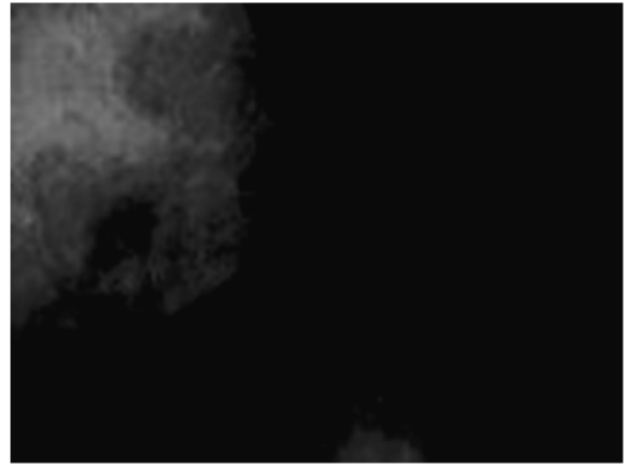
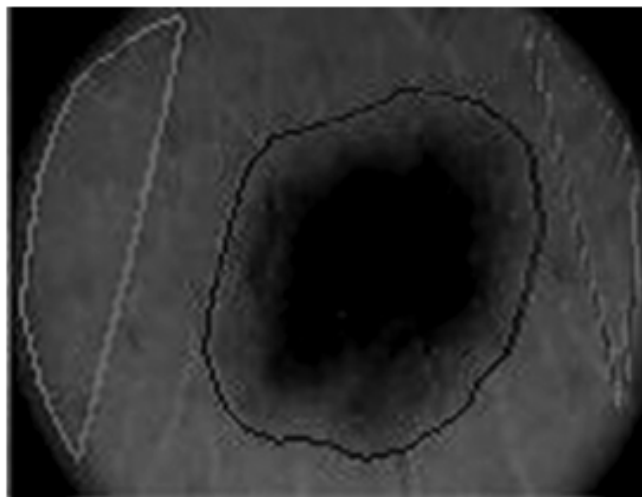


Figure 3: Processed Image

## 8.2. Division Process

Greater part of the methods utilized as a part of tending to division of dermoscopic pictures depend on shading and grayscale thresholding which are frequently not able to characterize an unmistakable basis to isolate with exactness the pigmented sore from the foundation solid skin. We mean to take after an approach that decides the limit of the sore by district developing (after a conceivable starting stride in light of fluffy sets to upgrade the injury area of enthusiasm) to confine suspicious sore locale in the PSL pictures (Zagrouba and Barhoumi, 2004).



Segmentation image

### 8.3. Highlight Extraction and Classification

While the ABCD manage has turned into a standard utilized by numerous dermatologists, its symptomatic use by dermatologist in light of visual and subjective assessment of such criteria are regularly subjective (Schmid-Saugeona et al., 2003). This study would however portray the ABCD manage (which serves as the ground truth) into quantitative properties measured by picture examination, and beg surface investigation strategy (to depict the spatial game plan of pixels which territorial power or shading alone may not adequately portray) with Gabor wavelet (to make scale, interpretation and revolution invariant) keeping in mind the end goal to robotize the arrangement procedure. Multilayer Perceptron Classifier (MLP) can then be utilized to order the sore as being amiable or harmful.

### 8.4. Analytic Accuracy Assessment

We would utilize the level of affectability and specificity of the outcome got by the classifier to evaluate the indicative exactness of the framework. Our approach is look at our usage of ABCD administer (Stolz et al., 1994) with picked machine learning options order, for example, calculated relapse Affectability is a factual measure that characterizes the level of genuine positive subjects with harmful status in the aggregate gathering of subjects with the infection. Specificity measures the precision of genuine negative subjects without threatening status in the aggregate gathering of subjects with the infection.

### 8.5. Information Collection Technique

Impressive extensive extent of the PSL pictures is been examined from the Dermatology Society of South Africa (DSSA), and the rest is intended to be gotten by means of online web asset of known PSL symptomatic results and pictures.

### 8.6. Look into Ethics

- a) Protection from Harm: There is no predictable mischief that the examination group or conceivable members would likely experience, be it physical, social, or enthusiastic.
- b) Right to Privacy: Privacy would be kept up by not unveiling personalities of the subjects whose PSL picture is being utilized for the study. Likewise, suitable reference to applicable creators would be made over the span of the study.
- c) Confidentiality: Should a need emerge for the examination group to speak with any of the subject whose PSL picture is being utilized, correspondences would be dealt with private.
- d) Sample Data: Appropriate reference would be made to distinguish the wellsprings of test information utilized. The group would likewise guarantee deception of test information is stayed away from.

## 9. CONCLUSION

Programmed conclusion of skin growth is attainable and achievable through the utilization of very much characterized division and arrangement method. While numerous achievement has been recorded in the present advances in computerization of therapeutic determination, this study has a tendency to augment the substantial accessibility of pervasive gadgets and elicitation of past skin disease finding picture set towards giving financially savvy, less demanding and quicker conclusion for underserved territories.

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