ISSN XXXX XXXX © 2017 IJESC

Research Article Volume 7 Issue No.11

Automated Skin Lesion Segmentation and Classification of Granular Parakeratosis using Support Vector Machine

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Abstract:
An automated method to detect and analyze the granular parakeratosis is presented to improve diagnosis which will lead to the exact treatment. Granular parakeratosis (also known as "Axillary granular parakeratosis", "Intertriginous granular parakeratosis", and more recently, "Zombie Patch") is a skin disease that is identified by brownish-red keratotic papules that can coalesce into plaques. Granular parakeratosis (GP) occurs due to lack of keratin with a distinctive histology where parakeratosis with retention of keratohyaline granules is identified in the epidermis. Granular parakeratosis is generally presented as pruritic hyper pigmented ie itching or erythematous patches (redness of skin) and plaques in intertriginous areas, more commonly in women than men. Here, we are presenting a novel approach for automatic segmentation and classification of skin lesions. This is focused towards the development of improved Automatic Lesion Detection System (ALDS) framework for segmenting skin lesions and later Support Virtual Machine (SVM) will be applied for the classification of the segment. A support vector machine is used to construct a hyperplane or set of hyperplanes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks.

Indexterms: Segmentation, Automatic Lesion Detection System, Skin lesion, Granular parakeratosis, Support Virtual Machine

I. INTRODUCTION

Granular parakeratosis is a rare, benign skin disease that presents as erythematous (redness of the skin or mucous membranes, caused by hyperemia i e increased blood flow) to brown hyperkeratotic papules that can coalesce into plaques. The term "granular parakeratosis" is used to describe not only the skin condition, but also a particular histological reactive pattern on biopsy specimens that are either regarded as the disease itself, or as an incidental finding. In the last decades, the digital images produced by educational, medical, industrial, scientific and other applications are used to diagnose the various diseases. The drastic growth of digital electronics industries has posed many challenges in dealing with huge amount of image data. The management of the expanding visual information has become a challenging task. Image Segmentation is one of the important issues occurred in times of before computer visualization. The fundamental objective of image segmentation is to segment a picture into its constituent areas [1] and accordingly, the action of handling the image can be essentially diminished. These separations are the image objects that claim related texture. The image segmentation brings about an arrangement of areas that mutually cover the image totally or deliver an arrangement of contours separated from the image. The pixels of image areas are connected through its trait or figured properties like color, intensity and texture. The same characteristics make neighboring regions to be different. The most recurrent issue related with image segmentation is the requirement of an integrity measure that can independently assess its functioning. The reason for this trouble is the absence of total ground truth because of various manual segmentations of a similar image. It is the issue of apportioning an image into its constituent parts. In carefully picking a segment that highlights the part and main properties of every segment, we get a solid description of an image regarding its valuable parts. Contingent upon the end application, the issue of segmentation can be subjective or objective. An effective image processing system can be potentially used to segment the granular parakeratosis images. The authors of [2] created a model which can characterize the pigmented skin lesion. Users can query the database by feature attribute values like shape and texture, or by synthesized image colors. Gnanasigamony [3] developed a system for retrieving skin lesion images based on shape similarity. Alfonso Baldi [4] presented a CBIR system for dermatoscopic images. Their approach includes image processing, segmentation, feature extraction (colour and textures) and similarity matching. Classification methods range from discriminant analysis to neural networks and support vector machines. So based on the desired segmentation and classification of the experimenting dataset, the system may opt the Support Vector Machine. A support vector machine constructs a hyperplane or set of hyperplanes in a high- or infinite- dimensional space, which can be used for classification, regression, or other tasks.

II. LITERATURE SURVEY

In this section, we review some of the primary techniques available in literature for medical image segmentation. In the recent years, various schemes for processing medical images appeared in literature. Researchers have developed many schemes and techniques for segmenting and characterizing the medical images. The use of segmentation is to partition an image into strong correlated parts with “area of interest” in the image. Image segmentation ends,

when the object of focus is separated. Segmentation can be classified as complete and partial. Complete segmentation consequences in a set of disjoint regions corresponding absolutely with input image objects, whereas in partial segmentation, resultant regions do not match directly with input image. Usually, image segmentation is treated as a pattern recognition problem as segmentation requires classification of pixels. In medical imaging automated description of different image components are used for analyzing anatomical structures such as skin lesions, bones, muscles blood vessels, tissue types, pathological regions(like cancer, multiple sclerosis lesions) and for dividing an entire image into sub regions. In [5], the authors segmented lesion areas using region growing method. Later, Color and texture features are extracted to represent segmented lesion areas. Then the classification is performed with SVM, KNN and fusion of SVM and KNN Classifiers. It is observed that the performance of the system has decreased due to the fact that feature selection methods are not used to select good features Garrett Nelson MD, Mary H. Lien MD, Jane L. Messina MD, Sonali Ranjit BS, and Neil Alan Fenske [6] examined Paraffin-embedded, H&E-stained sections of a punch biopsy and demonstrated slight acanthosis, and a sparse superficial perivascular dermal lymphocytic infiltrate. The most striking feature was marked- thickening of the stratum corneum, which was hypereosinophilic. Ding CY, Liu H, Khachemoune A [7] proposed the reappraisal of GP as a reactive pattern, rather than a distinct entity the authors of [8] carried out segmentation process to extract the lesion area from the selected image. The features are extracted from the segmented image based on the Gray Level Co-occurence Matrix (GLCM) method. GLCM is a method used to extract texture features from a gray level image. The various skin lesions are classified based on their texture features using Support Vector Machine (SVM) and K Nearest Neighbor (KNN) classifiers. This system extracts only texture features of the selected image to perform classification. Other features such as color, shape etc can be extracted to get better classification An automated skin cancer diagnostic system is proposed based on self-advising SVM in [9]. Self-advising SVM uses information generated from misclassified data in the training phase and thus, improves the SVM performance by transferring more information from the training phase to the test phase. It is also taken into account that diverse range of features can be extracted from skin images using state of the art feature extraction methods to enhance the classification performance of the classifier. But the system fails to develop more reliable diagnostic system. In [10], SVM has been implemented for classification of benign from malignant skin tumor. MATLAB package is used to implement the software in the current work, these feature were carried out to generate training and testing of the proposed SVM. But this paper concludes that there are some possible factors to improve the accuracy of detecting malignant melanoma A.A.L.C Amarathunga [11] presented a development of a skin diseases diagnosis system which allows user to identify diseases of the human skin and to provide advises or medical treatments in a very short time period. They used various classifiers to calculate and evaluate the accuracy level of our system. Multi-Layer Perceptron (MLP) and J48 were main classifiers used. This system considers only three skin diseases. They are Eczema, Impetigo and Melanoma. They developed this only for windows application. It is not yet developed for smart phones like Android, IOS and etc. And another thing is when capturing the image, the distance between camera lens and affected skin is 5cm.

III. METHODOLOGY

Image segmentation results in a set of segments that collectively cover the entire image, or a set of contours extracted from the image. The proposed work develops an improved ALDS framework for segmenting and later SVM will be applied for the classification of the segment to ascertain that whether the case under consideration is granular parakeratosis or not. In machine learning, support vector machines (SVMs, also support vector networks) are supervised learning models associated with learning algorithms that analyze data used for classification and regression analysis. A support vector machine is used to construct a hyperplane or set of hyperplanes in a high- or infinite- dimensional space that can be used for classification and regression. Support vector machine models make use of kernel functions (including e.g. linear, radial basis function, polynomial and spline kernels). In general it relates to several kernel based learning methods. The block diagram of SVM is as shown in figure 1:

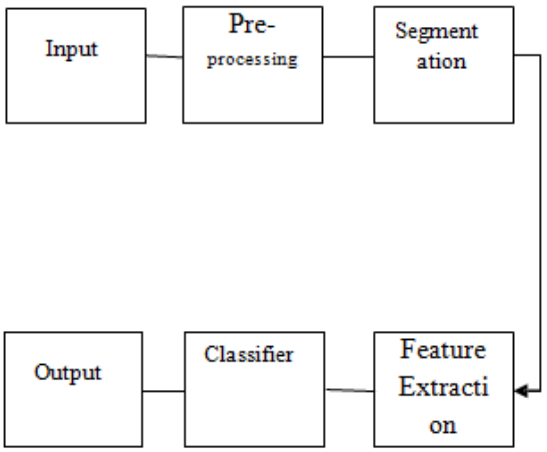

Figure.1. Block diagram of SVM

Input image:
Input to proposed system is dermoscopic images

Preprocessing:
Skin images have certain extraneous artifacts such as skin texture, dermoscopic gel and hair that make border detection a bit difficult. In order to reduce the effect of these artifacts on segmentation results, it is necessary to preprocess the images with a smoothing filter. Goal of pre-processing is an improvement of image data that reduces unwanted distortions and enhances some image features important for further image processing. Image pre-processing involves three main things: 1) Grayscale conversion 2) Noise removal 3) Image enhancement.

Grayscale conversion –
Grayscale image contains only brightness information. Each pixel value in grayscale image corresponds to an amount or quantity of light. The brightness graduation can be differentiated in grayscale image. Grayscale image measures only light intensity. 8 bit image will have brightness variation from 0 to 255 where '0' represents black and '255' represents white.

Noise Removal –
The objective of noise removal is to detect and removed unwanted noise from digital image. The Difficulty is in deciding which features of an image are real and which

are caused by noise. Noise is random variations in pixel values.

Image enhancement –

The objective of image enhancement is to process an image to increase visibility of feature of interest. Segmentation: Segmentation is a technique that parititions an image into its constituent regions or objects. That is, segmentation must be stopped when the objects of interest in an application has been obtained. There are many methods for segmentation: watershed based segmentation, split and merge, region growing, threshold based segmentation etc.

Feature extraction:

Feature extraction plays an important role in extracting information present in given image. Here, we can use color, texture and color histogram features to represent lesion areas. The reason to choose these types of features is because of the fact that color and texture are the only properties dominating in the lesion region

Classifier:

Image classification analyzes the numerical properties of various image features and organizes data into categories. Classification algorithms typically employ two phases of processing: training and testing. In the training phase, characteristic properties of typical image features are isolated and, based on these, a unique description of each classification category, i.e. training class, is created. In the subsequent testing phase, these feature- space partitions are used to classify image features. Here, support vector machine is used. A support vector machine develops a hyperplane or set of hyperplanes in a high- or infinite-dimensional space that can be used for classification, regression, or other tasks.

Advantages and disadvantages of support vector machines: Advantages-

- It is effective in high dimensional spaces.
- Also effective in cases where number of dimensions is greater than the number of samples.
- It uses a subset of training points in the decision function (called support vectors), so is also memory efficient.
- Versatile: Various Kernel functions can be specified for the decision function. Common kernels are provided, but it is also possible to specify custom kernels.

Disadvantages –

- If the number of features is greater than the number of samples, it is better to avoid over-fitting in choosing Kernel functions and regularization term is crucial.
- SVMs do not directly provide probability estimates. Instead these are calculated using an expensive five-fold cross-validation

IV. CONCLUSION

Granular parakeratosis is a skin disease that is identified by brownish- red keratotic papules that can coalesce into plaques. This occurs due to lack of keratin keratinization with a distinctive histology wherein parakeratosis with retention of keratohyaline granules is identified in the epidermis. An effective image processing system support vector machine can be potentially used to segment the lesions of granular parakeratosis. Image Segmentation is one of the important issues occurred in times of before computer visualization. The fundamental objective of image segmentation is to segment a picture into its constituent areas. This segmentation can be applied to skin disease like granular parakeratosis and later Support Virtual Machine (SVM) will be applied for the classification of the segment.

V. REFERENCES

[1]. Sukhjinder Kaur, Puneet Mittal" Segmentation of Overlapping Elliptical Objects using K-Mean Clustering Method", International Journal of Advanced Research in Computer Science, Volume 8, No. 5, ISSN No. 0976-5697, May-June 2017.

[2]. G Wiselin Jiji, P Johnson Durai Raj, "An Extensive Technique to Detect and Analyze Melanoma: A Challenge at the International Symposium on Biomedical Imaging (ISBI)" 2017

[3]. Gnanasigamony Wiselin Jiji, Peter Savariraj Johnson Durai Raj, "Content- based image retrieval in dermatology using intelligent technique", IEEE Xplore Digital Library, 02 April 2015

[4]. Alfonso Baldi, Raffaele Murace, Emanuele Dragonetti, Mario Manganaro, Stefano Bizzi, "Automated Content-Based Image Retrieval: Application on Dermoscopic Images of Pigmented Skin Lesions", springerlink,

[5]. Sumithra Ra, Mahamad Suhil, D.S.Guruc, "Segmentation and Classification of Skin Lesions for Disease Diagnosis", International Conference on Advanced Computing Technologies and Applications (ICACTA2015), Elsevier, Procedia Computer Science 45(2015) 76 – 85

[6]. Garrett Nelson MD, Mary H. Lien MD, Jane L. Messina MD, Sonali Ranjit BS, and Neil Alan Fenske: "Submammary Granular Parakeratosis Treated With Mastopexy", JDD (Journal of Drugs in Dermatology) Aug 2017

[7]. Ding CY, Liu H, Khachemoune A: "Granular Parakeratosis: A Comprehensive Review and a Critical Reappraisal", US National Library of Medicine, National Institutes of Health, Dec 2015

[8]. Fathima Nizar, G.S Santhosh Kumar, "Classification of Various Skin Lesions using SVM and KNN Classifiers", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 8, August 2016

[9]. Ammara Masood, Adel Al-Jumaily, "SA- SVM based automated diagnostic System for Skin Cancer", Sixth International Conference on Graphic and Image Processing (ICGIP 2014), Proc. of SPIE Vol. 9443, 94432L © 2015 SPIE

[10]. Mohamed Khalad Abu Mahmoud, Adel Al- Jumaily, Yashar Maali, Khairul Anam, "Classification of Malignant Melanoma and Benign Nevi from Skin Lesions Based on Support Vector Machine", Fifth International Conference on Computational Intelligence, Modelling and Simulation, DO1 10.1109/CIMSim.20l3.45, 2013

[11]. A.A.L.C. Amarathunga, E.P.W.C. Ellawala, G.N. Abeysekara, C. R. J. Amalraj, "Expert System for Diagnosis of Skin Diseases", INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 4, ISSUE 01, JANUARY 2015