



Article Title: Skin Disease Detection Using Convolutional Neural Network and Support Vector Machine Classification

Skin Disease Detection Using Convolutional Neural Network and Support Vector Machine Classification

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ABSTRACT

Dermatological issues are one of the most preventable diseases in the world. Diagnosing skin problems early is essential for effective therapy. The method for identifying and treating skin injury is based on the specialist's level of competence and experience. Skin disease diagnosis has benefited from the application of AI calculations and the utilization of the large quantity of information available in hospitals and clinics. Existing the specialists employed numerous frameworks, instruments, and calculations. A small number of frameworks have been developed that are capable of correctly identifying skin diseases with varying degrees of suggestive precision. In this proposed convolutional neural networks and Support Vector Machine are used this approach is simple, fast and does not require expensive equipment other than a camera and a computer. The process makes use of machine learning technology to train itself with the various skin images. The main objective of this process is to increase the accuracy of skin disease detection and the three important features in image classification are texture, color and shape.

Keywords: Skin Disease Detection, CNN, SVM, Image Classification, Feature Extraction, Pre-Processing, Deep Learning, Texture.

1 Introduction

In general, skin diseases are chronic, infectious and sometimes may develop into skin cancer. Skin diseases must be diagnosed early to reduce their development and spread. The diagnosis and treatment of a skin disease takes longer time and causes financial and physical cost to the patient. Skin disease symptoms have matured into a reliable diagnostic tool. To address the issue of skin sickness detection and treatment, people utilised PC software that was preprogrammed. To recognise skin illnesses based on earlier skin ailment photographs. The datasets that analysts have used, the current state of skin infection recognition research, and analyses from the areas of image pre-processing, information expansion, deep learning models, and structure execution markers. This work provides an automated image-based method for diagnosing and categorizing skin problems that use machine learning classification. Computational approaches will be used to analyze, process, and relegate picture data to consider the many different characteristics of the photos that are being processed. Skin photographs are first filtered to remove undesirable noise from the image and then processed



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to enhance the picture's overall quality. It is possible to extract features from an image using advanced techniques such as Convolutional Neural Network (CNN), classify the picture using the SVM classification. More accuracy and faster delivery of results than the previous technique, also more efficient and reliable system.

2 Related Works

2.1 Segmentation Methods for Computer Aided Melanoma Detection Santy. A., Joseph.R. [2015].

Melanoma is one of the deadly diseases among skin cancer. Melanoma detection can be done by dermatological screening and biopsy tests which are time consuming and expensive that requires experts from medical field. Due to cost of dermatologist to screen every patient, an automated system is needed for melanoma detection so that death rates can be minimized if detected early. It can be done using various image processing techniques. An important step in the automated system of melanoma detection is the segmentation process which locates the border of skin lesion in order to separate the lesion part from background skin for further feature extraction. This paper gives a study on various segmentation techniques that can be applied for melanoma detection using image processing. Statistical region merging, iterative stochastic region merging, adaptive thresholding, color enhancement and iterative segmentation, multilevel thresholding are discussed in this paper. A comparative study of these segmentation methods is also performed based on the parameters accuracy, sensitivity and specificity. Multilevel thresholding has the highest accuracy and specificity and maximum sensitivity is obtained for iterative stochastic region merging.

2.2 Automated Detection of Melanoma in Dermoscopic Images J.L.G. Arroyo, B.G. Zapirain [2014].

In this paper a software system for the automated detection of melanoma over dermoscopic images is presented. The analysis is carried out by supporting in the "ABCD Rule" medical algorithm, undertaking the automated detection and characterization of the corresponding indicators. For this purpose the system uses different image processing techniques and three supervised machine learning tasks. To test the robustness of the system the different indicators of the algorithm are tested, obtaining good results of accuracy in all of them, and there also was determined in a direct way the diagnostic capacity of the system, obtaining results of 81.25 % of sensitivity and 77.14 % of specificity. Moreover, the system is also capable of analyzing macroscopic images, having been designed with multiplatform architecture and being firmly oriented to teledermatology, which is increasingly used. Automated detection of melanoma in dermoscopic images is an active area of research in the field of medical imaging and computer vision. Dermoscopy is a non-invasive technique that involves examining skin lesions using a handheld device with a magnifying lens and light source.



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2.3 Dermatological disease diagnosis using color-skin images Arifin.S, Kibria.G, [2012].

This paper presents an automated dermatological diagnostic system. Etymologically, dermatology is the medical discipline of analysis and treatment of skin anomalies. The system presented is a machine intervention in contrast to human arbitration into the conventional medical personnel based ideology of dermatological diagnosis. The system works on two dependent steps - the first detects skin anomalies and the latter identifies the diseases. The system operates on visual input i.e. high resolution color images and patient history. In terms of machine intervention, the system uses color image processing techniques, k-means clustering and color gradient techniques to identify the diseased skin. For disease classification, the system resorts to feedforward backpropagation artificial neural networks. In brief it was a challenging task since the human skin is one of the most difficult surface or terrain to analyze. It is unique and novel since our dataset was not acquired from secondary sources; rather it was a work of months of toil in an actual hospital of Bangladesh making the dataset a standard dataset which is completely new in perspective of Bangladesh. It should point out that it is to replace doctors because no machine can yet replace the human input on analysis and intuition.

2.4 Dermatological disease detection using image processing and artificial neural network Yasir.R, Rahman.A, [2014].

Skin diseases are among the most common health problems worldwide. In this article it proposed a method that uses computer vision based techniques to detect various kinds of dermatological skin diseases. It have used different types of image processing algorithms for feature extraction and feed forward artificial neural network for training and testing purpose. The system works on two phases- first pre-process the colour skin images to extract significant features and later identifies the diseases. Dermatology is the branch of medicine dealing with the hair, nails, skin and its diseases, it is a specialty with both medical and surgical aspects a dermatologist takes care of diseases, in the widest sense, and some cosmetic problems of the skin, scalp, hair, and nails. Human skin is one of the most unpredictable and difficult terrains to automatically synthesize and analyze due to its complexity of jaggedness, tone, presence of hair and other mitigating features. In a developing country like Bangladesh it is expensive for a large number of people to go to dermatologist for their skin disease problem. At first it was not easy for us as it were trying to analyse human skin characteristics since human skin is one of the most difficult surface to analyse.

2.5 Dermatology diagnosis with feature selection methods and artificial neural network Shuzlina Abdul-Rahman, Ahmad Khairil Norhan, [2012].

Dermatology or skin disease is one of the popular diseases among other diseases these days. The features similarities between different types of skin diseases make diagnosis of skin diseases very complex. A patient needs dermatologist that has a sound and vast good experience in skin diseases in order to give precise results at the right time. This paper elaborates a prototype with back propagation neural network (BPNN) to assist the



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dermatologist. This prototype improves expert diagnosis method in term of time efficiency and diagnosis accuracy. The use of two feature selection methods namely Correlation Feature Selection (CFS) and Fast Correlation-based Filter (FCBF) help by providing a smaller number of features with greater accuracy and faster response time. The adjustment of parameter in BPNN gives good performance. The paper discusses the employment of ANN and FS to classify types of dermatology diseases. The use of FS is beneficial in improving the overall performance for diagnosing the skin diseases. The proposed solution that incorporated BPNN and FS methods such as CFS and FCBF have shown better performance in terms of accuracy and minimal elapse times. Future enhancement is to develop a web based system for a better visualization and easy access.

2.6 Diagnosing skin diseases using an artificial neural network L. G. Kabari, F. S. Bakpo [2009].

Development of medical expert systems that use artificial neural networks as their knowledge bases appears to be a promising method for predicting diagnosis and possible treatment routine. This paper deals with the construction and training of an artificial neural network for Skin Disease Diagnosis (SDD) based on patients' symptoms and causative organisms. The artificial neural network constructed using a feed-forward architectural design is shown to be capable of successfully diagnosing selected skin diseases in the tropical areas. The work may in the future serve as a knowledge base for an expert system specializing in medical diagnosis, testing evaluation, treatment evaluation, and treatment effectiveness. The work serves as the first component of a much larger system that will assist physicians facilitate the reasonable ordering of tests and treatments and minimize unnecessary laboratory routines while reducing operational costs. The paper presented a framework for diagnosing skin diseases using artificial neural networks. The proposed system was able to achieve a high level of success using the artificial neural network technique. The features of the ANN provided learning capability, which makes the system opened ended to new disease conditions or variation of a known skin disease due to the mutation of the causative organism. This provides great flexibility in the diagnostic system and makes the system to be opened ended. With this flexibility in the system.

3 Proposed Work

In this paper, proposed pre-trained Convolutional Neural Networks (Alexnet) and SVM were used to plan the identification method. Our proposed approach is simple, fast and does not require expensive equipment other than a camera and a computer. The approach works on the inputs of a color image. Then resize the of the image to extract features using pre-trained convolutional neural network. After that classified feature using Multiclass SVM.

The main objective is to find the skin diseases using CNN (Convolutional Neural Network) and SVM (Support Vector Machine) classification. This process is to increase accuracy of skin disease detection. Clinical methods for diagnosing skin conditions are expensive and time-consuming. At a fundamental level, picture handling techniques assist in building a robotized



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assessing framework for dermatology. The extraction of components plays a crucial role in aiding in the classification of skin diseases. In this investigation, pre-trained convolutional neural networks and SVM were used to plan the identification method.

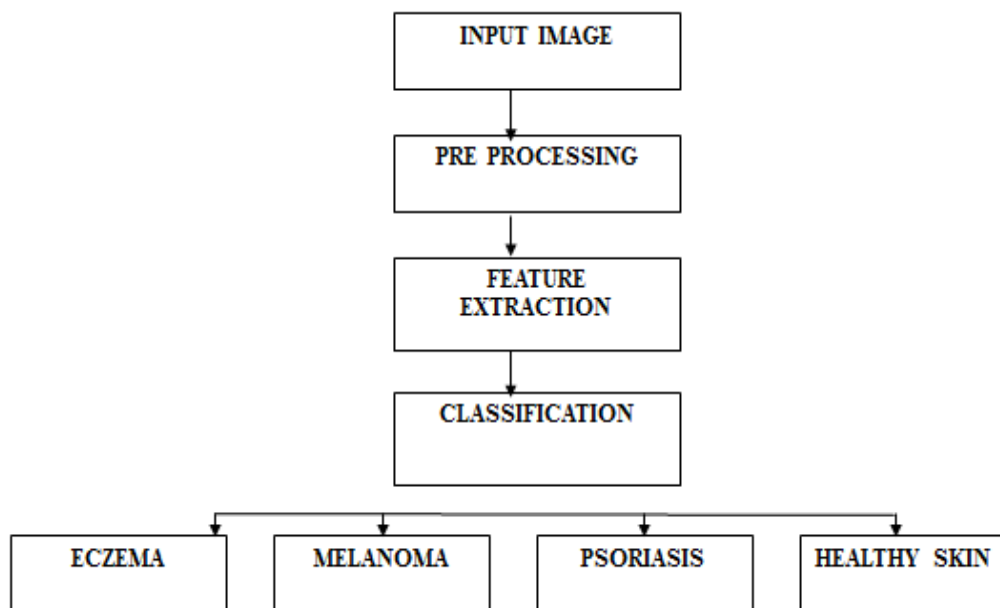


Figure 1: *Proposed Framework*

3.1 Modules

Input image: Collecting images from different websites specific to skin diseases. The database has images of every disease like Normal Images, Melanoma Images, Eczema Images and Psoriasis Images.

Pre-processing: Removing noise and sharpening the image improves the model's capacity to extract components and maintain good recognition quality. Removing noise would lessen the impact of hair and shadows on the identification of skin diseases.

Feature extraction: Feature extraction includes several convolution layers followed by Max-pooling and an Activation Function. The classifier usually consists of fully connected layers.

Classification: After extracting features, the role of classification is to classify the image via Support Vector Machine (SVM). A SVM can train classifier using extracted features from the training set.



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4 Result and Discussion

Skin disease detection using advanced learning approaches has recently attracted a lot of interest and made promising progress. In the published work, the skin disease analysis exhibits produced by advanced learning methods are compared to those produced by dermatologists. It takes a lot of research and creative framework development to develop and approve astounding computations or frameworks that support new imaging techniques. Dermoscopy assessment by dermatologists has the severe drawback of being abstract, and outcomes may vary depending on experience. The biopsy is anticipated to distinguish between benign and hazardous instances in this manner. Biasing innocuous skin diseases or lesions could make patients more anxious and disrupt the financial stability of the healthcare system. The ability to accurately and quickly diagnose skin diseases is severely hampered by the preparation, time, and experience required to perform a variety of current and emerging methods. A complete choice emotionally supportive network has not been developed, despite the existence of numerous robotized skin illness detection methods. In this section, it discuss the substantial challenges encountered in the field of in-depth skin infection analysis. Instead of detailing specific situations seen, it focus more on the key difficulties and identify the key causes of these problems. Then, at that point, it try to offer suggestions for how to resolve these concerns. Deep learning allows key component representations to be learned automatically from image pixels. The current important method for skin infection image identification is a convolution NN in DL, convolution, and combining activity of the convolutional network in picture acknowledgment, which has interpretation, pivot, and scale invariances.

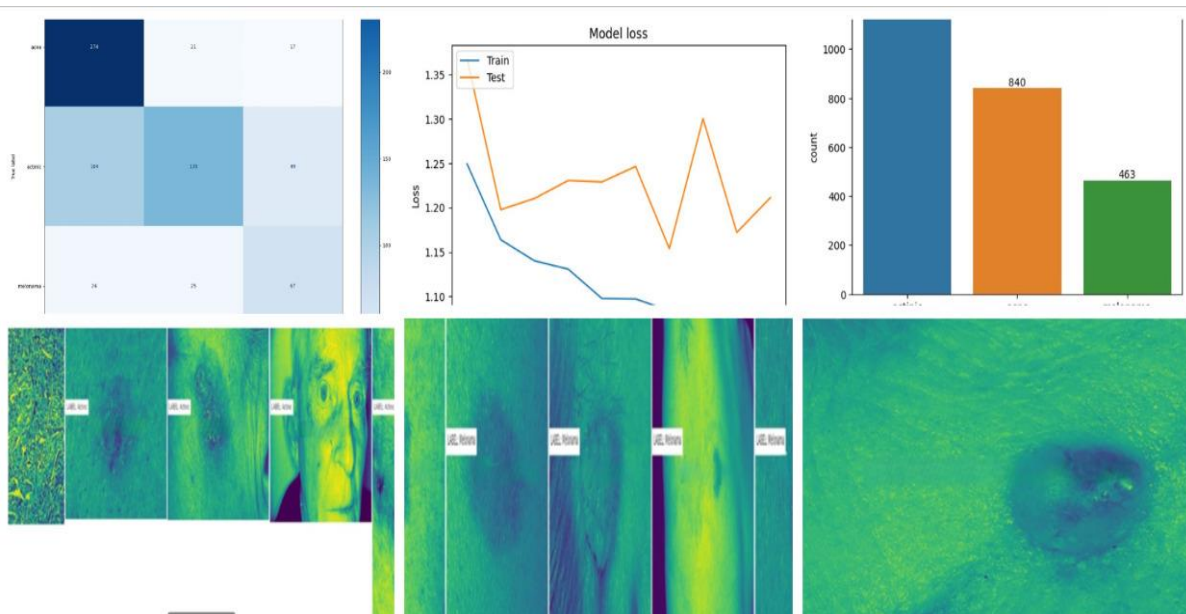


Figure 2: Skin Disease Classification.



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5 Conclusion

A crucial first step in reducing mortality rates, disease transmission, and the progression of skin infections is the identification of skin diseases. Clinical methods for diagnosing skin conditions are expensive and time-consuming. At a fundamental level, picture handling techniques assist in building a robotized assessing framework for dermatology. The extraction of components plays a crucial role in aiding in the classification of skin diseases. In this investigation, pre-trained convolutional neural networks and SVM were used to plan the identification method. Taking everything into account, it shouldn't forget that this examination helps identify skin diseases.

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