AI -BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASES WITH ERYTHEMA

Introduction

Skin diseases are more common than other diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. A skin disease may change texture or color of the skin. In general, skin diseases are chronic, infectious and sometimes may develop into skin cancer. Therefore, 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. In general, most of the common people do not know the type and stage of a skin disease. Some of the skin diseases show symptoms several months later, causing the disease to develop and grow further. This is due to the lack of medical knowledge in the public. Sometimes, a dermatologist (skin specialist doctor) may also find it difficult to diagnose the skin disease and may require expensive laboratory tests to correctly identify the type and stage of the skin disease. we propose an image processing-based approach to diagnose the skin diseases. This method takes the digital image or video frames of disease effect skin area then use image analysis to identify the type of disease. Our proposed approach is simple, fast and does not require expensive equipment's other than a camera and a computer.

Literature Review

[1] This Proposed system describes , although skin disease is a common disease, one in which early detection and classification is crucial for the successful treatment and recovery of patients, dermatologists perform most non invasive screening tests only with the naked eye. This may result in avoidable diagnostic inaccuracies as a result of human error, as the detection of the disease can be easily overlooked. Therefore, it would be beneficial to exploit the strengths of CAD using artificial intelligence techniques, in order to improve the accuracy of dermatology diagnosis. The segmentation and classification of skin diseases has been gaining attention in the field of artificial intelligence because of its promising results. Two of the more prominent approaches for skin disease segmentation and classification are clustering algorithms and support vector machines (SVMs).

Advantages

Clustering algorithms generally have the advantage of being flexible, easy to implement, with the ability to generalize features that have a similar statistical variance.

Disadvantages

An inherent disadvantage of clustering a skin disease is its lack of robustness against noise. Clustering algorithms rely on the identification of a centroid that can generalize a cluster of data. Noisy data, or the presence of outliers, can significantly degrade the performance of these algorithms.

[2] This Proposed system describes , an improved hybrid feature selection method, named improved F-score and Sequential Forward Search (IFSFS), which is a combination of filter and wrapper methods to select the optimal feature subset from the original feature set. The news IFSFS method improved the original F-score from measuring the discrimination of two sets of real numbers to measuring the discrimination between more than two sets of real numbers. The improved F-score and Sequential Forward Search (SFS) are combined to find the optimal feature subset in the process of feature selection. The best parameters of kernel function of SVM are found out by grid search technique. Xie and Wang then conducted experiments on different training-test partitions of the Erythemato – Squamous diseases dataset taken from UCI (University of California Irvine) machine learning database. Their experimental results show that the proposed SVM-based model with IFSFS achieves 98.61% classification accuracy and contains 21 features. The authors conclude that their method is very promising compared to the previously reported results.

Advantages

Experimental results showed that their proposed hybrid methods construct efficient diagnosis classifiers with high average accuracy when compared with traditional algorithms.

Disadvantages:

Although, the CART classifier achieved a better accuracy than some methods such as ANN and C4.5, but it is strongly recommended that ensemble methods should be used to classify differential diagnosis of ESD. Further experimental investigations are needed to conduct a prediction model of ESD, using CART classifier in combination with other methods.

[3] Initially, skin images are filtered to remove unwanted hairs and noise and then the segmentation process is carried out to extract lesion areas. For segmentation, a region growing method is applied by automatic initialization of seed points. The segmentation performance is measured with different well known measures and the results are appreciable. Subsequently, the extracted lesion areas are represented by color and texture features. SVM and k-NN classifiers are used along with their fusion for the classification using the extracted features. The performance of the system is tested on our own dataset of 726 samples from 141 images consisting of 5 different classes of diseases. The results are very promising with 46.71% and 34% of F-measure using SVM and k-NN classifier respectively and with 61% of F-measure for fusion of SVM and k-NN.

Advantages

We consider color and texture features in this paper. One more point that needs to be observed is the learning algorithms. Although, many classifiers are used, fusion of decisions from multiple classifiers is recently gaining importance due to the fact that improvement in classification can be achieved.

Disadvantages

Based on the performance of the proposed model we have observed the performance of the system has decreased quite considerably for some classes and because of which the overall performance is also affected. This is due to a collection of dataset from internet resources.

[4] A skin lesion segmentation (SLS) method based on the separable-Unet with stochastic weight averaging is proposed in this work. Specifically, the proposed Separable-Unet framework takes advantage of the separable convolutional block and U-Net architectures, which can extremely capture the context feature channel correlation and higher semantic feature information to enhance the pixel-level

discriminative representation capability of fully convolutional networks (FCN). Further, considering that the over-fitting is a local optimum (or sub-optimum) .problem, a scheme based on stochastic weight averaging is introduced, which can obtain much broader optimum and better generalization.

Advantages

The proposed approach is compared with other state-of-the-art methods, and the results demonstrate that the proposed approach outperforms them for SLS on both melanoma and non-melanoma cases.

Disadvantages

Moreover, the considerably decreased computation time suggests that the proposed approach has potential for practical computer-aided diagnose systems, besides provides a segmentation for the specific analysis with improved segmentation performance.

[5] In this paper, we have presented the survey of more than 100 papers and comparative analysis of state of the art techniques, model and methodologies. Malignant melanoma is one of the most threating and deadliest cancers. Since the last few decades, researchers are putting extra attention and effort in accurate diagnosis of melanoma. The main challenges of dermoscopic skin lesion images are: low contrasts, multiple lesions, irregular and fuzzy borders, blood vessels, regression, hairs, bubbles, variegated coloring and other kinds of distortions. The lack of large training dataset makes these problems even more challenging. Due to recent advancement in the paradigm of deep learning, and specially the outstanding performance in medical imaging, it has become important to review the deep learning algorithms performance in skin lesion segmentation.

Advantages

It is expected to improve results by utilizing the capabilities of deep learning frameworks with other pre and post processing techniques so reliable and accurate diagnostic systems can be built.

Disadvantages

It also leaves the programmers clueless when they try to understand why certain aspects fail. Generally, deep learning algorithms sift through millions of data points to find patterns and correlations that often go unnoticed by human experts.

[6] Dermoscopy is one of the major imaging modalities used in the diagnosis of melanoma and other pigmented skin lesions. Due to the difficulty and subjectivity of human interpretation, computerized analysis of dermoscopy images has become an important research area. One of the most important steps in dermoscopy image analysis is the automated detection of lesion borders. In this

article, we present a systematic overview of the recent border detection methods in the literature paying particular attention to computational issues and evaluation aspects.

Advantages

Border determination by dermatologists appears to depend upon higher-level knowledge, therefore it is likely that the incorporation of domain knowledge in automated methods will enable them to perform better, especially in sets of images with a variety of diagnoses.

Disadvantages

Common problems with the existing approaches include the acquisition, size, and diagnostic distribution of the test image set, the evaluation of the results, and the inadequate description of the employed methods.

[7] This proposed system describes skin disease recognition by using neural network which based on the image analysis. In general, these diseases have similarities in pattern of infection and symptoms such as redness and rash. Diagnosis and recognition of skin disease take a very long term process because it requires patient's history, physical examination and proper laboratory diagnostic tests. Computer algorithm which contains few steps that involves image processing, image feature extraction and classification of data have been implemented with the help of classifier such as artificial neural network (ANN).

Advantages: The ANN can learn patterns of symptoms of particular diseases and provides faster diagnosis and recognition than a human physician. Thus, the patients can do the treatment for the skin disease faced immediately based on the symptoms detected.

Disadvantages: Not only do artificial neural networks, but also the statistical models can be trained with only numeric data, so it makes it very difficult for ANN to understand the problem statement

[8] This proposed system examine the use of AI methods for detecting erythema against the most clinically relevant skin conditions that may be "confusers". Early detection of erythema , and diagnosis and treatment of Lyme disease, avoids potential neurologic, rheumatologic, and cardiac complications. So they develop the most extensively curated dataset thus far for this challenging problem. We evaluate several deep learning models against various problems of growing complexity and on public domain and clinical images. Results suggest that AI can help in prescreening and referring individuals to physicians for earlier diagnosis and treatment**.**

Advantages : These results suggest that a DL system can help in prescreening and referring individuals to physicians for earlier diagnosis and treatment, in the presence of clinically relevant confusers, thereby reducing further complications and morbidity.

Disadvantages : It requires very large amount of data in order to perform better than other techniques. It is extremely expensive to **train** due to complex data models.

[9] A method of skin disease detection using Image Processing and machine learning" has proposed early detection method on image processing based on Convolutional neural network (CNN) to feature extraction and then using color to identify the features.

Advantages: CNNs can expand the advantages of SVMs, such as robustness in noisy datasets without the need for optimal preprocessing, by capturing image context and extracting high-level features through down-sampling. CNNs can interpret the pixels of an image within its own image-level context, as opposed to viewing each pixel in a dataset-level context.

Disadvantages: CNNs can have trouble generalizing to new domains or by learning unwanted correlations (like the background of an image for example) rather than the desired classes (the foreground).

[10] There are several techniques for image mining that can classify and predict various types of skin disorders based on their classifications. This paper presents image mining techniques. The augmentation, feature extraction and classification. On three different forms of skin disorders (acne, cold sore, hives), all these methods are applied and classification-based identification is performed.

The skin analyzing scenario can be organized and performed for early detection of skin disorders with the development of technology. The image and pattern-based exploration of different skin disorders, numerous technologies are available. Skin disorders can be categorized by image classification. Image classification is a supervised learning technique that characterized a lot of objective classes and trains a model to interpret the class.

Advantages:

Different image processing techniques were used to achieve a fast and highly precise classifier in the proposed work. Multiple modules for handling different steps are included in the overall process: noise removal, contrast improvement, segmentation, extraction of features and classification (diagnosis).

Disadvantages:

Data analytics is a complicated process and often requires people with training to use the tools. The barrier to entry for data analytics can discourage small businesses from using this technology. It can also be difficult to find adequate data that isn’t already private or proprietary in nature.

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