**AI -BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASES WITH ERYTHEMA**

**Introduction**

In general, most people are unaware of the type and stage of a skin disease. To diagnose skin diseases, we propose an image processing-based approach. This method uses image analysis to identify the type of disease based on digital image or video frames of the disease affect skin area. Our proposed method is simple, quick, and requires no expensive equipment other than a camera and a computer.

**Literature Review**

**[I]** This proposed system describes how early detection and classification are essential for patients' successful treatment and recovery. Therefore, it would be advantageous to leverage CAD's advantages using artificial intelligence techniques to increase the precision of dermatology diagnosis. Support vector machines and clustering algorithms are two of the more common methods for segmenting and categorizing skin diseases (SVMs)

**Advantages**

In general, clustering algorithms have the benefit of being adaptable, simple to use, and capable of generalizing features with a similar statistical variance.

**Disadvantages :**

Clustering a skin condition has a built-in weakness: it is not noise-resistant. The identification of a centroid that can generalize a cluster of data is the foundation of clustering algorithms. These algorithms' performance can be severely hampered by noisy data or the presence of outliers.

**[II]** This proposed system describes a better hybrid feature selection method known as improved F-score and Sequential Forward Search (IFSFS). In the feature selection process, the improved F score and Sequential Forward Search (SFS) are combined to find the optimal feature subset. Grid search is used to find the best kernel function parameters for SVM. According to the results of some experiments, the proposed SVM-based model with IFSFS achieves 98.61% classification accuracy and contains 21 features, making this method very promising when compared to previously reported results.

**Advantages**

When compared to traditional algorithms, the experimental results showed that their proposed hybrid methods construct efficient diagnosis classifiers with high average accuracy.

**Disadvantages:**

The CART classifier outperformed the other methods in terms of accuracy. It is strongly advised to use ensemble methods to classify differential diagnosis of ESD.

**[III]** Skin images are first filtered to remove unwanted hairs and noise before being segmented to extract lesion areas. A region growing method with automatic seed point initialization is used for segmentation. Following that, color and texture features are used to represent the extracted lesion areas. For classification using extracted features, SVM and k-NN classifiers are used, along with their fusion. The results are very promising, with F-measures of 46.71% and 34% for SVM and k-NN classifiers, respectively, and 61% for SVM-k-NN fusion.

**Advantages :**

We consider color and texture features in this paper. 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 discovered that the system's performance has decreased significantly for some classes, affecting overall performance. This is due to a dataset collection from internet resources.

**[IV]** This paper proposes a skin lesion segmentation (SLS) method based on the separable-Unet with stochastic weight averaging. The proposed Separable-Unet framework, in particular, makes use of the separable convolution block and U-Net architectures, which can effectively capture context feature channel correlation and higher semantic feature information to improve the pixel-level discriminative representation capability of fully convolutional networks (FCN). Furthermore, given that over-fitting is a local optimum (or sub-optimum) problem, a scheme based on stochastic weight averaging is proposed, which can achieve a much broader optimum and better generalization.

**Advantages :**

The proposed method is compared to other state-of-the-art methods, and the results show that it outperforms them for SLS in both melanoma and non-melanoma cases.

**Disadvantages :**

Furthermore, the significantly reduced computation time suggests that the proposed approach has practical potential for computer-aided diagnosis systems, in addition to providing a segmentation for the specific analysis with improved segmentation performance.

**[V]** In this paper, we presented a survey of over 100 papers as well as a comparative analysis of cutting-edge techniques, models, and methodologies. Malignant melanoma is one of the most dangerous and lethal cancers. Since the last few decades, researchers have focused extra attention and effort on accurate melanoma diagnosis. Low contrasts, multiple lesions, irregular and fuzzy borders, blood vessels, regression, hairs, bubbles, variegated coloring, and other types of distortions are the main challenges of dermoscopic skin lesion images. These problems are exacerbated by the lack of a large training dataset.

**Advantages :**

It is expected to improve results by combining the capabilities of deep learning frameworks with other pre and post processing techniques, allowing for the development of reliable and accurate diagnostic systems.

**Disadvantages :**

It also leaves programmers perplexed when attempting to understand why certain aspects fail. Deep learning algorithms sift through millions of data points to find patterns and correlations that human experts frequently miss.

**[VI]** 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 rely on higher-level knowledge; therefore, the incorporation of domain knowledge in automated methods is likely to improve performance, particularly in sets of images with a variety of diagnoses.

**Disadvantages :**

The acquisition, size, and diagnostic distribution of the test image set, the evaluation of the results, and the inadequate description of the employed methods are all common issues with existing approaches.

**[VII]** This proposed system describes skin disease recognition by using a neural network which is based on 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 a patient's history, physical examination and proper laboratory diagnostic tests. Computer algorithms which contain a few steps that involve image processing, image feature extraction and classification of data have been implemented with the help of classifiers such as artificial neural networks (ANN).

**Advantages**:

The ANN can recognise and diagnose diseases more quickly than a human physician because it can learn patterns of symptoms. As a result, patients can begin treatment for the skin disease they are experiencing as soon as the symptoms are detected.

**Disadvantages:**

Not only artificial neural networks, but also statistical models, can be trained using only numerical data, making it difficult for ANN to comprehend the problem statement.

**[8]** This proposed system investigates the use of artificial intelligence (AI) methods for detecting erythema against the most clinically relevant skin conditions that may be "confusers." Early detection of erythema, as well as early diagnosis and treatment of Lyme disease, reduces the risk of neurologic, rheumatologic, and cardiac complications. As a result, they create the most meticulously curated dataset for this difficult problem to date. We compare several deep learning models to various problems of increasing complexity, as well as to public domain and clinical images. According to the findings, AI can assist in prescreening and referring individuals to physicians for earlier diagnosis and treatment.

**Advantages** :

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

**Disadvantages :**

To outperform other techniques, it necessitates a massive amount of data. Due to the complexity of the data models, training is extremely expensive.

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