AI-BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASES WITH ERYTHEMA

Introduction:

More people have skin conditions than other illnesses. Skin conditions can be brought on by viruses, germs, allergies, fungal infections, and more. A skin condition can alter the skin's tone or texture. Skin conditions tend to be persistent, contagious, and occasionally carcinogenic. To prevent the onset and spread of skin diseases, early diagnosis is therefore necessary. A skin condition requires more time for diagnosis and treatment, and the patient incurs both financial and physical costs. The majority of regular people often are not aware of the type and stage of a skin illness. Some skin conditions don't manifest symptoms for several months, which allows the illness to grow and spread. Because of their lack of medical expertise, the public. Sometimes, a dermatologist (a medical professional who specializes in skin conditions) may also have trouble diagnosing the skin condition and may need pricey laboratory testing to pinpoint the condition's kind and stage. We suggest using image processing to diagnose skin conditions. This technique uses digital images or video frames of the affected skin area and image processing to determine the disease's type. Our suggested strategy is easy, and quick, and does not need expensive equipment beyond a camera and a computer.

Literature Review:

[1] PAPER 1:

YEAR: 2021

NAME: AI-based localization and classification of skin disease with erythema

AUTHOR: Ha Min Son;Wooho Jeon;Jinhyun Kim;Chan Yeong Heo;Hye Jin Yoon;Ji-Ung Park;Tai-Myoung Chung

METHODOLOGY:

Although dermatologists do the majority of non-invasive screening tests merely with the naked eye, skin illness is a frequent disease for which early detection and classification are essential for patient success and recovery. Due to the ease with which the condition might be missed, this may result in unnecessary diagnostic errors caused by human error. Therefore, it would be advantageous to use CAD's advantages utilizing artificial intelligence approaches to increase the precision of dermatology diagnosis. Due to its promising outcomes, the segmentation and classification of skin diseases have been attracting attention in the field of artificial intelligence. Clustering algorithms and k-means clustering are two of the more well-known methods for segmenting and classifying skin diseases and support vector machines (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 selection 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.

[2] PAPER 2:

YEAR: 2011

NAME: Using support vector machines with a novel hybrid feature selection method for diagnosis of erythemato-squamous diseases

AUTHOR: Juanying Xie, Chunxia Wang

METHODOLOGY:

An improved hybrid feature selection is described in this proposed system. To choose the best feature subset from the initial feature set, an approach known as improved F-score and Sequential Forward Search (IFSFS) combines filter and wrapper methods. The original F-score was enhanced by the new IFSFS technique, which measured the discriminating between more than two sets of real numbers instead of just two. The ideal feature subset is discovered during the feature selection process by combining the enhanced F-score and Sequential Forward Search (SFS). The grid search method is used to identify the optimal SVM kernel function parameters. Then, using various training-test partitions of the Erythemato-Squamous illnesses dataset obtained from the UCI machine learning database, Xie and Wang conducted experiments. The suggested SVM-based model with IFSFS achieves 98.61% classification accuracy, according to their experimental findings, and has 21 features. The authors conclude that, in comparison to previously reported findings, their strategy is quite promising.

ADVANTAGES:

When compared to conventional algorithms, experimental results demonstrated that their proposed hybrid techniques generate effective diagnosis classifiers with high average accuracy.

DISADVANTAGES:

Although some methods, including ANN and C4.5, performed better than the CART classifier in terms of accuracy, ensemble methods are strongly advised for classifying differential diagnoses of ESD. To perform a prediction model of ESD utilizing the CART classifier in conjunction with other techniques, additional experimental studies are required.

[3] PAPER 3:

YEAR: 2015

NAME: Segmentation and Classification of Skin Lesions for Disease Diagnosis

AUTHOR: R.Sumithra, MahamadSuhil, D.S.Guru

METHODOLOGY:

Skin photos are first filtered to remove unwelcome hairs and background noise before being segmented to isolate lesion regions. A region growth method using automatic seed point initialization is used for segmentation. The findings of measuring the segmentation performance using many well-known metrics are noteworthy. Then, color and texture features are used to represent the extracted lesion regions. For the classification process employing the retrieved features, SVM and k-NN classifiers are combined. On our dataset of 726 samples from 141 photos representing 5 different types of disorders, the system's performance is evaluated. With 46.71% and 34% of F-

measure using SVM and k-NN classifiers, respectively, and with 61%, the results are highly encouraging.

ADVANTAGES:

In this study, we take into account color and texture aspects. The learning algorithms are a further topic that needs to be considered. Even if there are numerous classifiers in use, the current rise in importance of classifier decision fusion is owing to the possibility of improving classification.

DISADVANTAGES:

According to our observations of the proposed model's performance, the system's performance has declined noticeably for specific classes, which has an impact on the performance as a whole. This is a result of gathering the dataset from online sources.

[4] PAPER 4:

YEAR: 2019

NAME: Efficient skin lesion segmentation using separable-Unet with stochastic weight averaging

AUTHOR: Tang P, Liang Q, Yan X, Xiang S, Sun W, Zhang D, Coppola G

METHODOLOGY:

In this work, a skin lesion segmentation (SLS) technique using stochastic weight averaging and the separable-Unit is developed. To improve the pixel-level discriminative representation capability of fully convolutional networks, the proposed Separable-Unit framework specifically makes use of the separable convolutional block and U-Net architectures, which can extremely capture the context feature channel correlation and higher semantic feature information (FCN). A strategy based on stochastic weight averaging is also given, which can produce a considerably larger optimum and greater generalization, taking into account that over-fitting is a local optimum (or sub-optimum) problem.

ADVANTAGES:

The results show that the proposed strategy works better for SLS on both melanoma and non-melanoma instances when it is compared to other cutting-edge methodologies.

DISADVANTAGES:

Additionally, the approach's promise for practical computer-aided diagnosis systems is indicated by the calculation time significant reduction. It also offers a segmentation for the particular analysis with increased segmentation performance.

[5] PAPER 5:

YEAR: 2020

NAME: Deep Learning Approaches Towards Skin Lesion Segmentation and Classification from Dermoscopic Images

AUTHOR: Baig R, Bibi M, Hamid A, Kausar S, Khalid S

METHODOLOGY:

The study of more than 100 papers and comparative analysis of cutting-edge approaches, models, and strategies are offered in this work. The most dangerous and lethal type of cancer is malignant melanoma. Since a few decades ago, researchers have

focused particular attention and effort on providing precise melanoma diagnoses. Low contrast, many lesions, irregular and fuzzy boundaries, blood vessels, regression, hairs, bubbles, variegated coloration, and other types of distortions are the main difficulties with dermoscopic skin lesion images. These issues are made more difficult because there is a lack of a significant training dataset. Due reviewing the effectiveness of deep learning algorithms in the skin has become crucial due to new developments in the paradigm of deep learning, especially given their exceptional performance in medical imaging by lesion segmentation.

ADVANTAGES:

By combining the capabilities of deep learning frameworks with various pre- and post-processing methods, it is anticipated that outcomes will improve and that dependable and accurate diagnostic systems can be created.

DISADVANTAGES:

The programmers are likewise left in the dark when they attempt to figure out why some components fail. Millions of data points are typically combed through by deep learning algorithms to uncover patterns and correlations that frequently escape the attention of human specialists.

[6] PAPER 6:

YEAR: 2009

NAME: Lesion border detection in dermoscopy images.

AUTHOR: M Emre Celebi, Hitoshi Iyatomi, Gerald Schaefer, William V Stoecker

METHODOLOGY:

One of the main imaging techniques used to diagnose melanoma and other pigmented skin lesions is dermoscopy. Computerized analysis of dermoscopy pictures has emerged as a significant field for research due to the challenge and subjectivity of human interpretation. The automatic identification of lesion borders is one of the most significant phases in dermoscopy picture analysis. We provide a thorough analysis of the most recent border detection techniques in the literature in this article, paying close attention to computational challenges and evaluation factors.

ADVANTAGES:

Dermatologists seem to rely on higher-level knowledge when determining borders, therefore it stands to reason that adding domain knowledge to automated systems will improve their performance, particularly in sets of photos with a variety of diagnoses.

DISADVANTAGES:

The acquisition, size, and diagnostic distribution of the test picture set, the evaluation of the outcomes, and the inadequate presentation of the used methodologies are common issues with the current approaches.

[7] PAPER 7:

YEAR: 2019

NAME: EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks

AUTHOR: Mingxing Tan, Quoc Le

METHODOLOGY:

The suggested system uses neural networks to describe skin disease recognition. A network that is built on image analysis. In general, the infection patterns and symptoms of many diseases—such as redness and rash—are identical. Skin disease diagnosis and recognition is a very drawn-out process that calls for patient history, physical examination, and appropriate laboratory diagnostic testing. With the use of classifiers like artificial neural networks, computer algorithms that include a few steps for image processing, image feature extraction, and data categorization have been put into practice (ANN).

ADVANTAGES:

The ANN can recognise patterns in the symptoms of specific diseases and provides faster recognition and diagnosis than a human doctor. As a result, based on the symptoms identified, patients can begin therapy for the skin ailment they are experiencing right away.

DISADVANTAGES:

In addition to artificial neural networks, statistics b because only numerical data can be used to train models, it is exceedingly challenging for ANN to comprehend the issue description.

[8] PAPER 8:

YEAR: 2010

NAME: Erythema detection in digital skin images

AUTHOR: Juan Lu; Jonathan H. Manton; Ed Kazmierczak; Rodney Sinclair

METHODOLOGY:

In the suggested approach, the most clinically significant skin disorders that could be "confusers" are used to test the use of AI algorithms for erythema detection. Potential neurologic, rheumatologic, and cardiac consequences can be avoided by detecting erythema early, as well as by correctly diagnosing and treating Lyme disease. As a result, they create the most meticulously curated dataset available for this difficult issue. We assess some deep learning models using both publicly available and authentic clinical photos and a variety of problems of increasing complexity. The findings imply that AI can assist in prescreening and sending people to doctors for earlier diagnosis and therapy.

ADVANTAGES:

These findings imply a DL system can aid in prescreening. Moreover, in the case of clinically relevant confusers, directing patients to doctors for earlier diagnosis and treatment, so preventing future difficulties and morbidity.

DISADVANTAGES:

To perform better, a huge amount of data is necessary than alternative methods. Due to sophisticated data models, training is very expensive.

[9] PAPER 9:

YEAR: 2013

NAME: Skin disease analysis and tracking based on image segmentation.

AUTHOR: Trabelsi, O., Tlig, L., Sayadi, M. & Fnaiech, F

METHODOLOGY:

Utilizing machine learning and image processing, a technique for detecting skin diseases. Convolutional neural network (CNN)-based feature extraction and color-

based feature identification are the foundations of learning's early detection technique for image processing.

ADVANTAGES:

The benefits of SVMs, such as their resilience in collecting visual context and extracting high-level characteristics by downsampling, it is possible to process noisy datasets without the need for ideal preparation. Instead of viewing each pixel in a dataset-level context, CNNs may comprehend an image's pixels inside the context of the image itself.

DISADVANTAGES:

The generalization of CNNs to new domains or by instead of learning the desired classes, one learns undesirable associations (such as the background of an image, for example) (the foreground).