LITERATURE SURVEY ON

AI- BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASE WITH ERYTHEMA

Domain: Artificial Intelligence

Team id: PNT2022TMID29594

Batch no: B7-1A3E

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Paper 1: AI-based localization and classifcation of skin disease with erythema

Publication year: 05 MARCH 2021

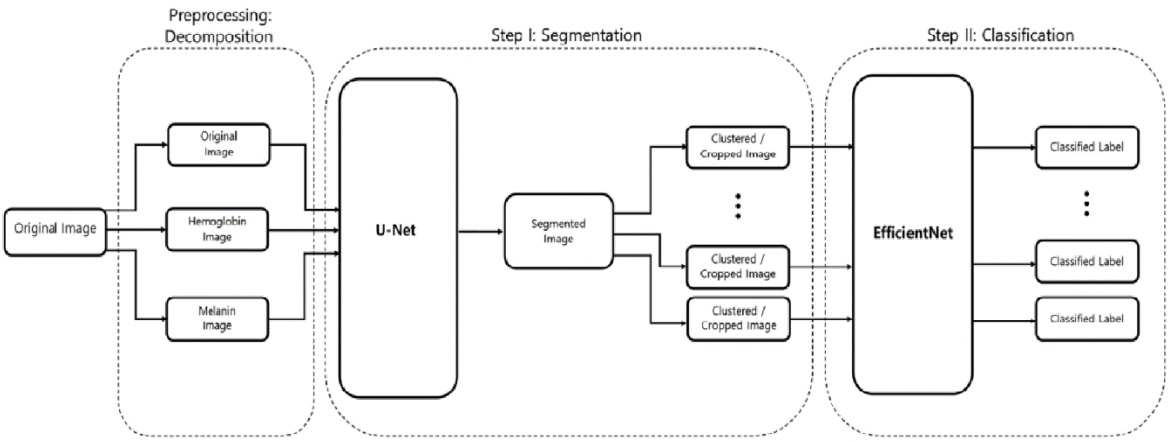
Author name: Ha Min Son , Wooho Jeon , Jinhyun Kim , ChanYeong Heo , Hye JinYoon1 , Ji-Ung Park 2* & Tai-Myoung Chung

Journal name: www.nature.com/scientificreports

Summary:

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). Clustering algorithms generally have the advantage of being flexible, easy to implement, with the ability to generalize features that have a similar statistical variance. One person experimented with various clustering algorithms, such as fuzzy c-means, improved fuzzy c-means, and K-means, achieving approximately 83% true positive rates in segmenting a skin disease.

Noisy data, or the presence of outliers, can significantly degrade the performance of these algorithms. Therefore, with noisy datasets, caused by images with different types of lighting, non-clustering algorithms may be preferred.



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Conclusion :

We have shown that even without a large dataset and high-quality images, it is possible to achieve sufcient accuracy rates. In addition, we have shown that current state-of-the-art CNN models can outperform models created by previous research, through proper data preprocessing, self-supervised learning, transfer learning, and special CNN architecture techniques. Furthermore, with accurate segmentation, we gain knowledge of the location of the disease, which is useful in the preprocessing of data used in classification, as it allows the CNN model to focus on the area of interest. Lastly, unlike previous studies, our method provides a solution to classify multiple diseases within a single image. With higher quality and a larger quantity of data, it will be viable to use state-of-the-art models to enable the use of CAD in the feld of dermatology

Paper 2:An Intelligent System for Monitoring Skin Diseases

Publication year: 07, July-2022.

Author name: Dawid Połap Alicja Winnicka, Kalina Serwata, Karolina K ˛esik and Marcin Wo ´zniak

Journal name: Institute of Mathematics, Silesian University of Technology,

Summary:

Skin diseases can manifest themselves differently, especially when the new distinctive signs are visible. These types of changes may appear slowly, which often avoids quick observation. It is particularly important to analyze any new nevus on the skin, because this can start to change, which is one of the first symptoms of skin cancer. Changes are visible and often classified as follows

- A(asymmetry)—any two halves of the nevus are asymmetrical;
- B(border)—the boundary between the healthy tissue and the nevus is fuzzy, tilted or invisible;
- C (color)—the nevus has different shades of color, and the border between them is irregular;
- D (diameter)—the diameter is greater than 6 mm;
- E (evolving)—there is a sudden enlargement or bulge.

However any suspicious change in nevus shape, color or structure requires particular attention.

Conclusion:

This research has shown that the proposed classification method works well. We were able to train our system to reach overall accuracy of 82.4% and precision of 80.4%, which is very good result. Comparison to the results from other similar solutions is presented in Table 3. Analyzing the table we see that our method is not the best, since, for example, the Circular center + Support Vector Machine [34] achieved 94% accuracy but on the other hand, our solution has beaten other methods based on Support Vector Machine alone by reaching higher values.

<u>Paper 3</u>: Skin Disease Detection using Machine Learning

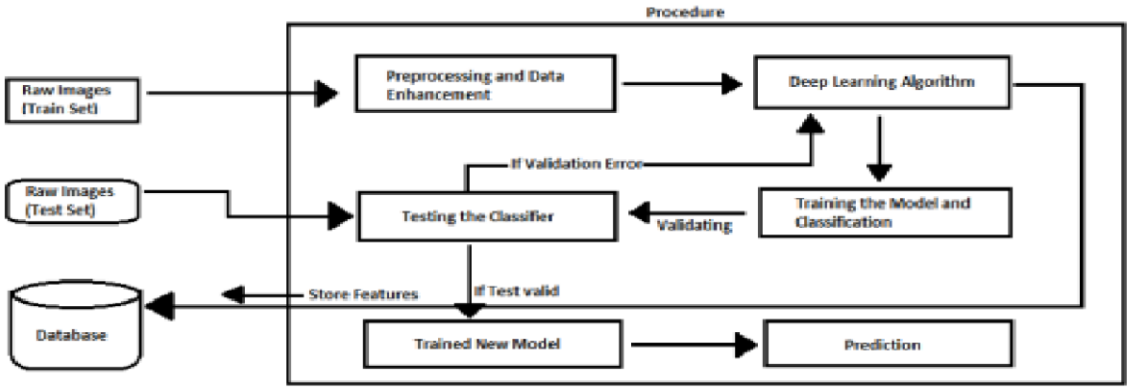
Publication year: August 2020.

Author name: Kritika Sujay Rao, Pooja Suresh Yelkar, Omkar Narayan Pise, Dr. Swapna Borde.

Journal name: International Journal of Engineering Research & Technology (IJERT)

Summary:

Skin diseases are the 4th common cause of skin burden worldwide. Robust and Automated system have been developed to lessen this burden and to help the patients to conduct the early assessment of the skin lesion. Mostly this system available in the literature only provide skin cancer classification. Treatments for skin are more effective and less disfiguring when found early and it is a challenging research due to similar characteristics of skin diseases. In this project we attempt to detect skin diseases .A novel system is presented in this research work for the diagnosis of the most common skin lesions (Melanocytic nevi, Melanoma, Benign keratosis-like lesions, Basal cell carcinoma, Actinic keratoses, Vascular lesion, Dermatofibroma). The proposed approach is based on the pre-processing, Deep learning algorithm, training the model , validation and classification phase. Experiments were performed on 10010 images and 93% accuracy is achieved for seven-class classification using Convolution Neural Networks (CNN).



<u>Conclusion:</u>

Skin Diseases are ranked fourth most common cause of human illness, but many still do not consult doctors. We presented a robust and automated method for the diagnosis of dermatological diseases. Treatments for skin are more effective and less disfiguring when found early. We should point out that it is to replace doctors because no machine can yet replace the human input on analysis and intuition. Researches in European Society of Medical Oncology have shown for the first time that form of AI or ML is better than experienced dermatologists. In this a brief description of the system and the implementation methodology is presented.

Paper 4: A Method Of Skin Disease Detection Using Image Processing And Machine Learning

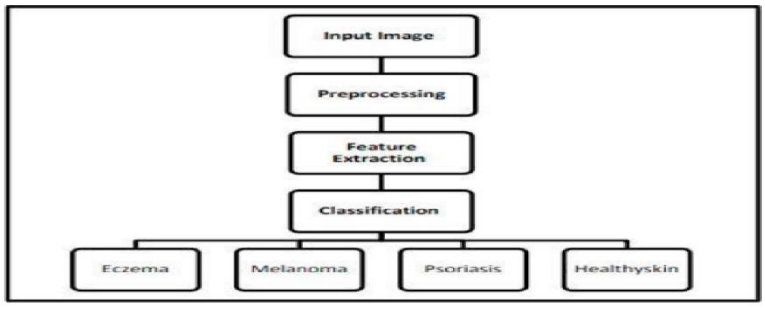
Publication year: 2019

Author name: Nawal Soliman ALKolifi ALEnezi

Journal name :16th International Learning & Technology Conference 2019.

Summary:

Several researchers have proposed image processing-based techniques to detect the type of skin diseases. Here we briefly review some of the techniques as reported in the literature. In [1], a system is proposed for the dissection of skin diseases using color images without the need for doctor intervention. The system consists of two stages, the first the detection of the infected skin by uses color image processing techniques, k-means clustering and color gradient techniques to identify the diseased skin and the second the classification of the disease type using artificial neural networks. The system was tested on six types of skin diseases with average accuracy of first stage 95.99% and the second stage 94.016%. In the method of [2], extraction of image features is the first step in detection of skin diseases. In this method, the greater number of features extracted from the image, better the accuracy of system. The author of [2] applied the method to nine types of skin diseases with accuracy up to 90%. Melanoma is type of skin cancer that can cause death, if not diagnose and treat in the early stages. The author of [3], focused on the study of various segmentation techniques that could be applied to detect melanoma using image processing. Segmentation process is described that falls on the infected spot boundaries to extract more features. The work of [4] proposed the development of a Melanoma diagnosis tool for dark skin using specialized algorithm databases including images from a variety of Melanoma resources. Similarly, [5] discussed classification of skin diseases such as Melanoma, Basal cell carcinoma (BCC), Nevus and Seborrheic keratosis (SK) by using the technique support vector machine (SVM). It yields the best accuracy from a range of other techniques. On the other hand, the spread of chronic skin diseases in different regions may lead to severe consequences. Therefore, [6] proposed a computer system that automatically detects eczema and determines its severity. The system consists of three stages, the first effective segmentation by detecting the skin, the second extract a set of features, namely color, texture, borders and third determine the severity of eczema using Support Vector Machine (SVM). In [7], a new approach is proposed to detect skin diseases, which combines computer vision with machine learning. The role of computer vision is to extract the features from the image while the machine learning is used to detect skin diseases. The system was tested on six types of skin diseases with accurately 95%.



Conclusion:

In this research the method of detection was designed by using pretrained convolutional neural network (AlexNet) and SVM. In conclusion, we must not forget that this research has an effective role in the detection of skin diseases in Saudi Arabia because it has a very hot weather for the presence of deserts; this indicates that skin diseases are widespread. This research supports medical efficiency in Saudi Arabia.

Paper 5: Intelligent System for Skin Disease Prediction using Machine Learning

Publication year: August 2021.

Author name: Ahmed A. Elngar , Rishabh Kumar , Amber Hayat , Prathamesh Churi .

Journal name Journal of Physics Conference Series · August 2021

Summary:

- For skin disease detection and prediction, the support vector machine is mostly used.
- The accuracy of SVM is around 80-90% depending upon the dataset used.
- Skin disease dataset is taken from UCI machine repository as it contains thousands of images for various skin diseases.
- The parameters like accuracy, F measure, Specificity, Entropy is used for analysis of the results.

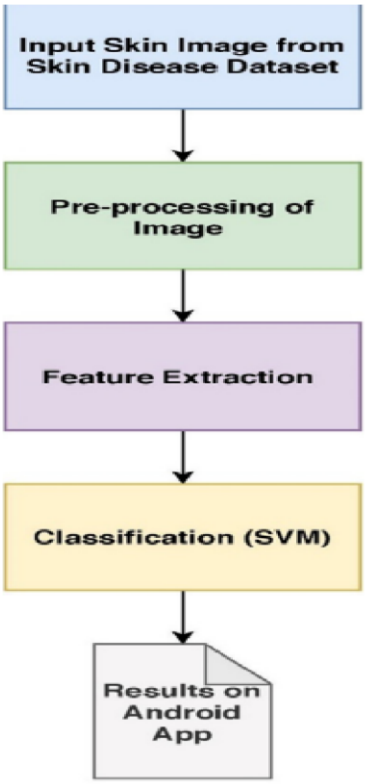


Figure 3: Process flow of classification algorithm SVM

Paper 6: SKIN LESION CLASSIFICATION FROM DERMOSCOPIC IMAGES USING DEEP LEARNING TECHNIQUES

Publication year: January 2017

Author name: Adria Romero Lopez, Xavier Giro-i-Nieto, Jack Burdick, Oge Marques

Summary:

In this paper, a novel method for skin lesion classification using deep learning is proposed, implemented, and successfully benchmarked against a publicly available skin lesion dermoscopic image dataset (the ISIC Archive dataset [5]). It uses an existing convolutional neural network (CNN) architecture – VGGNet (Very Deep Convolutional Network for Large-Scale Visual Recognition) developed by the Visual Geometry Group of the University of Oxford [6] in three different ways: (i) training the CNN from scratch; (ii) using the transfer learning paradigm to leverage features from a VGGNet pre-trained on a larger dataset (ImageNet [7]); and (iii) keeping the transfer learning paradigm and fine-tuning the CNNs architecture. This paper is structured as follows: Section 2 reviews related work and associated datasets and challenges; Section 3 described the proposed solution (and its variants) and associated methods and tools; Section 4 presents the results of experiments and discusses their significance; finally, Section 5 offers concluding remarks and directions for future work.

Conclusion:

We propose a solution for assisting dermatologists during the diagnosis of skin lesions. More specifically, we have designed and implemented a two-class classifier that takes skin lesion images labeled as benign or malignant as an input, builds a model using deep convolutional neural networks, and uses this model to predict whether a (previously unseen) image of a skin lesion is either benign or malignant. The proposed approach achieves promising results – most notably, a sensitivity value of 78.66% and a precision of 79.74% – which are significantly higher than the current state of the art on this dataset (50.7% and 63.7%, respectively). Avenues for future work include: (i) using a larger dataset to help lessen the risk of overfitting; (ii) performing additional regularization tweaks and fine-tuning of hyperparameters; and (iii) training the architecture with Dermnet – a skin related dataset – rather than Imagenet, a general dataset.

Paper 7: Automated Skin Disease Identification using Deep Learning Algorithm

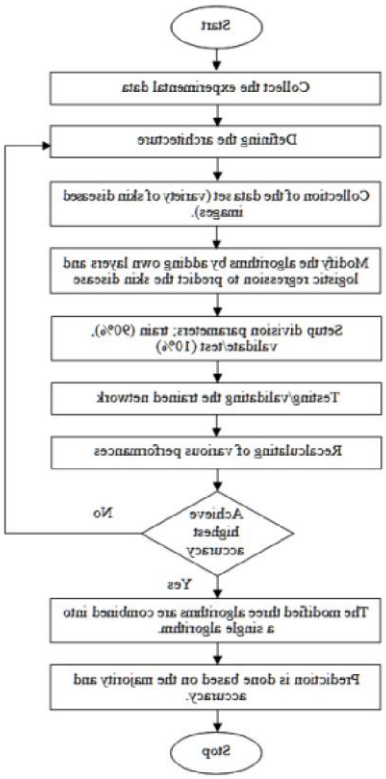
Publication year: September 2018.

Author name: Sourav Kumar Patnaik, Mansher Singh Sidhu, Yaagyanika Gehlot, Bhairvi Sharma and P Muthu

Journal name: Department of Biomedical Engineering, SRM Institute of Science and Technology.

Summary:

This study projects a method that uses techniques related to computer vision to distinguish different kinds of dermatological skin abnormalities. We have employed various types of Deep learning algorithms (Inception_ v3, MobileNet, Resnet, xception) for feature extraction and learning algorithm (preferably Random forest or Logistic Regression) for training and testing purpose. Using the state of the art architecture considerably increases the efficiency up to 88 percentage. And further more by using ensemble features mapping, combing the models trained using Inception V3, MobileNet, Resnet, Xception a voting based model will be ensembled and thereby increasing the efficiency13. For enhanced performance and selecting the optimum architecture for the application, we have used logistic regression technique. In this method, the divide mode is set to 90% for the training of the data, 10% for the validating/testing of the data. To characterize the efficiency of a classification model (or "classifier") on a set of test data for which the true values, a table of confusion matrix is used.



CONCLUSION:

In this work a model for prediction of skin diseases is done using deep learning algorithms. It is found that by using the ensembling features and deep learning we can achieve a higher accuracy rate and also we can go for the prediction of many more diseases than with any other previous models donebefore. As the previous models done in this field of application were able to report a maximum of six skin diseases with a maximum accuracy level of 75%. By implementing deep learning algorithm we are able to predict as many as 20 diseases with a higher accuracy level of 88%. This proves that deep learning algorithms have a huge potential in the real world skin disease diagnosis. If even a better system with high end system hardware and software with a very large dataset is used the accuracy can be increased considerably and the model can be used for clinical experimentation as it does have any invasive measures. Future work can be extended to make this model a standard procedure for preliminary skin disease diagnosis method as it will reduce the treatment and diagnosis time.

Paper 8: Digital Dermatology - Skin Disease Detection Model Using Image Processing

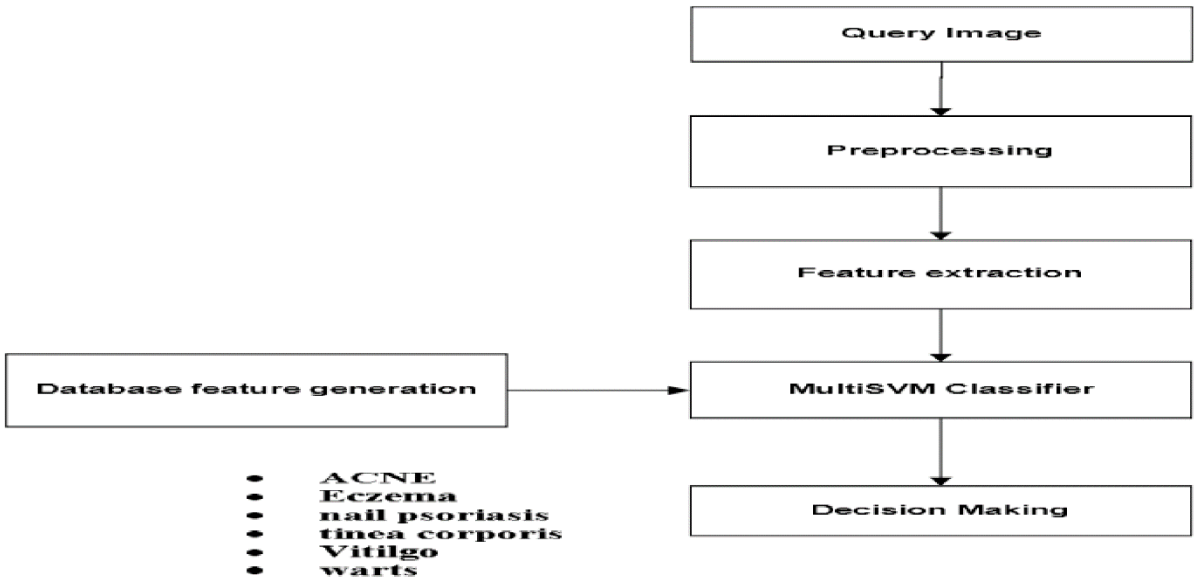
Publication year:July 2018

Author name: Shashi Rekha G , Prof.H.Srinivasa Murthy, Dr.Sudarson Jena.

Journal name : International Journal of Innovative Research in Science, Engineering and Technology.

Summary:

Geographical factors like season and climate also affect. In developing countries, overcrowding and poor hygiene are responsible for spreading of skin diseases. The pattern of skin diseases varies from country to country. Moreover, remote areas are severely affected. The prevalence of skin diseases in a tertiary care center of Garhwali hills, North India was recorded in 2014 and it was found to vary from 6.3% to 11.2%. Of the total population, 16.7% were affected by acne, 3.4% by psoriasis, 3.4% by urticaria, 3.6% by Melasma and 3.3% by vitiligo. WHO (World Health Organization) has emphasized the severity of skin diseases in India which accounts for 10 to 12 percent of India's population. There are only 6000 dermatologists present to cater to a population of 121crore people and most of these dermatologists are concentrated in the cities. Due to this, rural areas are lacking dermatologists. The current practices used by dermatologists include biopsy, scrapings, diascopy, patch testing and prick Test which are invasive methods of detection. In patch testing and prick test, the allergen is directly applied to the infected area. The skin might take a long time even several days to react to the allergen. There are also certain disadvantages of the current image processing techniques used for skin disease detection. The main problem with the median filter is its high computational cost. Also, the software implementation of median filter does not provide accurate results.



CONCLUSION:

Skin Diseases being extremely common must be detected at the earliest stage. The proposed system provides a feasible solution for skin disease detection providing up to 80% efficiency. The average training time for the three transforms and the parallel combination was found to be 2.066 seconds and the average testing time was found to be 0.7866 seconds.

The proposed system is able to detect many types of distributed diseases with many distributed regions closed together and unable to detect the diseases that have distributed regions separated by distance. For Future, multiple methods can be used for accurate detection with secured result analysis.

Paper 9: A machine learning method based on the combination of nonlinear and texture features to diagnose malignant melanoma from dermoscopic images.

Publication year: March 3rd, 2021.

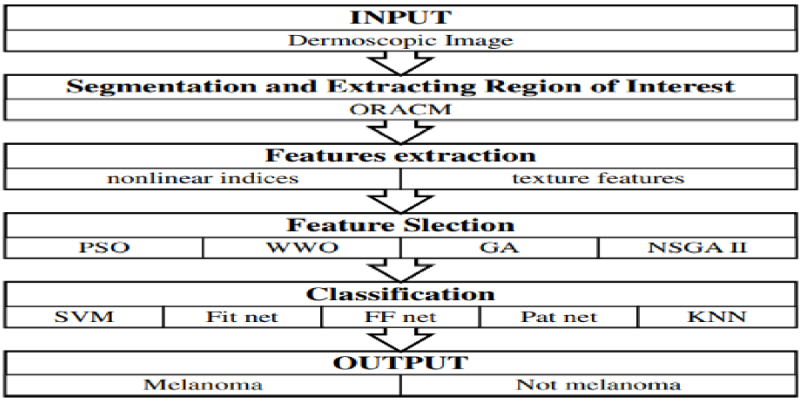
Author name: Sepehr Salem Ghahfarrokhi, Hamed Khodadadi

Journal name: Research Square.

Summary:

Skin cancer affects people of all skin tones, including those with darker complexions. Melanomas are known as the malignant tumors of skin cancer, resulting in an adverse prognosis, responsible for most deaths relating to skin cancer. Early diagnosis and treatment of skin cancer from dermoscopic images can significantly reduce mortality and save lives. Although several Computer-Aided Diagnosis (CAD) systems with satisfactory performance have been introduced in the literature for skin cancer detection, the high false detection rate has made it inevitable to have an expert physician for more examination. In this paper, a CAD system based on machine learning algorithms is provided to classify various skin cancer types.

Accordingly, the best-obtained precision of 99.24% based on five-fold cross validation is attained by the selected features of texture and nonlinear indices through NSGA II, applying the pattern net classifier. Also, the comparison between this paper's experimental results and other similar works with the same dataset demonstrates the proposed method's efficiency.



CONCLUSION:

In the present research, a combination of nonlinear indices and texture features are selected by a multi-objective optimization algorithm to distinguish the skin lesion types. Disorder growth of cancerous cells originated from the chaotic essence of its causation process, caused the complexity measures can reflect the asymmetry and border irregularities of skin lesions. On the other hand, the texture features attained from LH and HL sub-bands represent the image content's information. The selection of the appropriate indices utilizing a multi-objective optimization method as well as using various machine

learning approaches for the type detection of dermoscopic skin lesion images can be considered as the main characteristics of this study. Furthermore, the performed experiments employing a dermoscopic image dataset, consisting of melanoma and non-melanoma cases, confirmed the proposed method's ability in skin lesion distinguishing. Hence, improving the dermoscopic images' classification precision through the presented CAD system can enhance the dermatologist's diagnostic ability during the medical inspection.

Paper 10: A Machine Vision Approach for Classification of Skin Cancer Using Hybrid Texture Features

Publication year: 18 July 2022.

Author name: Syeda Shamaila Zareen ,Sun Guangmin ,Yu Li ,Mahwish Kundi,Salman Qadri , Syed Furqan Qadri ,Mubashir Ahmad , and Ali Haider Khan .

Journal name: Faculty of Information Technology, Beijing University of Technology.

Summary:

Image processing is a method deployed by information technology and computer scientist that is used in medical science. In, a system describes the skin disease by using colored image dataset without intervention of data.proposed system employed two different techniques such as identification of skin disease by using K-mean clustering, color image processing, and gradient method, and the result accuracy is 95.99%, (2) artificial neural network (ANN) technique is employed for classification process, and the result accuracy is 94.016%. Kumar et al.proposed a technique that evaluates skin infection with combination of machine learning and computer vision approaches. Features were extracted by CV and skin disease is evaluated by ML approach. *e result accuracy achieved is 95%. Region-based convolutional neural network (R-CNN) techniques were employed for detecting infection, including three methodologies such as proposal of region, transformation of vector, and classification. In researchers employed GoogleNet Inspection V-3 CNN model for classification of skin diseases or cancer. used 3374 dermatoscopic images and 129,450 clinical image datasets of skin cancer. *e overall accuracy is 72.1 ± 0.9.

Conclusion:

Within the confines of this investigation, multifeature analysis parameters were utilised to classify each of the five separate skin cancer datasets. proposed model for the classification of skin cancer is more reliable and resilient than other previous models because it analyses skin cancer datasets using 9 first-order statistical histograms and 220 GLCM texture properties. With the use of these easily accessible and optimized feature datasets, a total of four distinct machine vision classifiers—the NB, BN, LMT Tree, and MLP classifiers—were applied.MLP classifier had a score of 97.133 percent, which indicated that it was more accurate than any of the other machine vision classifiers. In the future, our primary focus will be on conducting ongoing validation and enhancement of our approach, as well as novel applications such as multiclass classification and segmentation of 3D medical pictures will be our key emphasis.

Paper 11: Recognition of Dermatological Disease Area for Identification of Disease

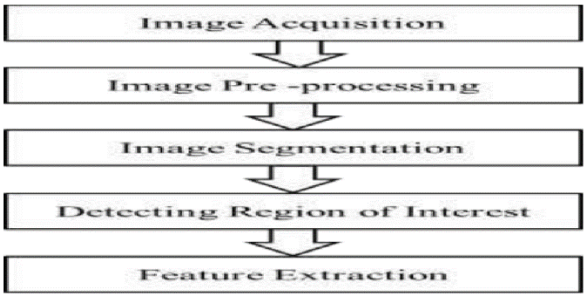
Publication year: May 2016.

Author name: Prashant B. Yadav, 2Mrs. S.S. Patil.

Journal name: International Journal of Scientific Development and Research (IJSDR).

Summary:

Skin diseases in everywhere tend to be prevalent due to climatic as well as the living situation of the vast majority of people. Skin diseases not only affect the skin but also it has a huge impact on person day to day life, lead to depression, restrict their movement, crush self-confidence, and even relationships. So it is needed to take skin disease seriously. Today, almost all the sectors and in other fields get the aid of computerized systems. In the field of medical science there is a great demand for computer-aided tools to facilitate many tasks. Many things that were done manually using traditional equipment have been replaced with automated systems. Modern medical science is looking for solution which could assist the doctors with any aspect of work using the new technology. Here we use various image processing technique such as rgb to gray conversion of image, image resize and image filtering using median filter. Localized segmentation is used extract the required image. Using this process features of images is extracted which is useful to identify the diseases and find out the stages of diseases.



Conclusion:

In this system we presented the automated system to find out the affected area from dermatological disease. As per the area results we decided stages of diseases that is initial stage, medium stage or final stage of disease. Localized Segmentation of the image has been done successfully. An algorithm has been developed to identify the area of infection from segmented image. In addition to work done above we can add some more advancement such as more feature extraction from image. Using the data to train artificial neural network by using such techniques we will obtain final results in next stage.

Paper 12 : Skin Cancer Detection Based on Extreme Learning Machine and a Developed Version of Thermal Exchange Optimization

Publication year : 3 November 2021

Author name: Shi Wang and Melika Hamian .

Journal name: Computational Intelligence and Neuroscience.

Summary:

- A new computer-aided method for the diagnosis of malignant melanoma.
- Segmenting the region of interest based on the Otsu method.
- Feature extraction to extract the beneficial features.
- A new optimized Deep Believe Network (DBN) to classify the melanoma cases.
- Optimization based on a developed version of the newly introduced ,ermal Exchange Optimization (dTEO) algorithm.

Conclusion:

In recent years, skin cancer has been recognized as the most dangerous and common type of cancer in humans. ,ere are different types of skin cancer. Melanoma is a common type of skin cancer, where early detection can be helpful in its treatment and can suggestively stop death from this deadly skin cancer. Designing an approach that facilitates the skin cancer detection in the early stages is very useful and valuable. In this study, an optimized pipeline procedure was utilized for the optimal detection of melanoma from dermoscopy images. In the proposed method, after preprocessing of the input dermoscopy images based on noise reduction and contrast enhance ment, the region of interest was segmented.