LITERATURE SURVEY

AI-BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASE WITH ERYTHEMA

Domain: Artificial Intelligence

Team ID: PNT2022TMID28486

Batch no: B7-1A3E

Team members: BHAVITHA.R[312819104016]

DHANALAKSHMI.G[312819104021]

BHUVANESHWARAN.A[312819104017]

ASWIN.P[312819104014]

Paper 1: AI Based localization and classification of skin disease with erythema

Publication year: 05 March 2021

Author name: Ha Min Son, Wooho Jeon, Jinhyun Kim, Chan Yeong Heo, Hye Jin Yoon, Ji-Ung Park & Tai-Myoung Chung

Journal name: https://www.nature.com/articles/s41598-021-84593-z

Summary:

The symptoms of most common skin diseases share a great deal of similarity, making disease classification challenging. Therefore, it would be advantageous to leverage CAD's advantages using artificial intelligence techniques to increase the precision of dermatology diagnosis. This study demonstrates how cutting-edge deep learning

models can be used to make CAD a practical option in the dermatology field. The

Due to its promising outcomes, segmentation and classification of skin diseases have gained attention in the field of artificial intelligence. Support vector machines and clustering algorithms are two of the more common methods for segmenting and categorising skin diseases (SVMs).

In general, clustering algorithms have the benefit of being adaptable, simple to use, and capable of generalising features with a similar statistical variance. Trabelsi et al.3 conducted research on

Several clustering algorithms, including fuzzy c-means, improved fuzzy c-means, and K-means, segmented a skin disease with true positive rates of about 83%. The ISODATA clustering algorithm was used by Rajab et al.4 to determine the best threshold for segmenting skin lesions. Clustering a skin condition has a built-in weakness: it is not noise-resistant. Clustering techniques rely on finding a centroid that can be used to generalise a cluster of data.

In this article, we outline a technique for combining two distinct

models to address a bigger issue. Skin disease models have previously been utilised for segmentation or classification. In this study, the output of a segmentation model serves as the input to a classification model, which sequentially combines both models. Additionally,while novel preprocessing techniques were employed in earlier studies of segmentation models other than CNN, recent developments in CNN have placed a greater emphasis on the model's architecture than on data preprocessing.

Conclusion:

We have shown that even without a large dataset and high-quality images, it is possible to achieve sufficient 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 field of dermatology.

Paper 2: Necrolytic migratory erythema is an important visual cutaneous clue of glucagonoma

Publication year: August 2022

Author name: Wei Li1,6, XueYang1,6, Yuan Deng2 , Yina Jiang2 , Guiping Xu3 , Enxiao Li4 , YinyingWu4 , Juan Ren5 , Zhenhua Ma1 , Shunbin Dong1 , Liang Han1 , Qingyong Ma1 , ZhengWu1* & ZhengWang1*

Journal name: www.nature.com/scientificreports

Summary:

A functional pancreatic neuroendocrine tumour called erythema, which develops from islet alpha cells in the pancreas' tail, is extremely rare and slow-growing. Glucagonoma syndrome, which frequently includes necrolytic migratory erythema (NME), diabetes mellitus (DM), stomatitis, anaemia, deep vein thrombosis (DVT), weight loss, diarrhoea, and other symptoms, is the most common

presentation. Other clinical manifestations, with the exception of NME, are nonspecific, which explains why most patients experience a delay in diagnosis and why at least 50% of cases already have metastatic disease at the time of diagnosis. In between 70 and 90 percent of patients with glucagonoma, NME is seen. This rash is typically widespread, and therefore the major sites of involvement are the perioral region, trunk, extremities and perineum. The distinguishing feature of NME is annular erythematous plaques with central bullous, ulcerative lesions surrounded by brown pigment, which are usually pruritic and painful. The histological features of this skin lesion include parakeratosis, hyperkeratosis, spongiosis of the epidermis with necrolysis, loss of the granular layer, vacuolization of keratinocytes, and perivascular and interstitial inflammation. This paper summarizes the clinical characteristics of seven typical patients with glucagonoma followed at our hospital during the past 10 years. Our cumulative experiences (including diagnosis and treatment) may help clinicians to raised recognize, diagnose and treat glucagonoma.

This study was approved by the ethics panel of the First Affiliated Hospital of Xi'an Jiao tong University and therefore the study was conducted in accordance with the approved guidelines. consent was obtained from all subjects and/or their legal guardian(s). We reviewed the database and picked up seven cases of glucagonoma within the past 10 years. Patients with clinical presentations of skin manifestation (the rash is characterized by an intense erythematous lesion, which shows superficial epidermal necrosis and spreads during a centrifugal pattern), glucagonoma syndrome, elevated plasma glucagon, and a pathological diagnosis of pancreatic islet cell tumor were included during this cohort. The

medical records of the included patients were reviewed. Tumor diameters were obtained from CT scan measurements. Follow-up data, including patients' follow-up status, symptoms (skin rash), recovery and administration of other therapies, were acquired from hospital medical records or by phone interviews with the patients, relatives, or general practitioners.

Conclusion:

Surgical removal is taken into account to be the only definitive and curative treatment for pancreatic glucagonoma and NME7 . Optional operations included simple enucleation (< 2 cm) with peripancreatic lymph dissection, pancreaticoduodenectomy with peripancreatic lymph dissection, distal
pancreatectomy with peripancreatic lymph dissection and splenectomy. However, more than half of all glucagonomas present with metastatic disease, most ordinarily liver metastasis**. it's** been reported that synchronous resection of pancreatic neuroendocrine tumors and liver metastasis (more than 30% of the liver tissue retained) provides a more favorable outcome. Liver transplantation could also be considered as a possible therapeutic approach for unresectable hepatic metastases arising from pancreatic glucagonoma20. TACE may additionally be a safe therapeutic approach for liver metastasis arising from NETs **due to** the highly vascular and blood supply that primarily derives from the hepatic artery21. additionally , RFA is usually performed together with surgery, which has certain advantages in removing isolated metastases22.

Medical therapy for glucagonoma, including chemotherapeutics, somatostatin analogous, PRRT and molecular

targeted drugs, are also effective in controlling clinical symptoms and tumour growth7,16. In conclusion, erythema may be a rare type of functional NET. Since NME could be the only clue for the first detection of this tumour, it's very important to correctly diagnose NME during a timely manner Currently, surgical intervention is that the only definitive treatment for this disease. Medical therapy is effective for symptom control and metastatic disease management.

Paper 3: Hyperspectral Imaging and Classification for Grading Skin Erythema

Publication year: 28 August 2018

Author name: Ramy Abdlaty 1†, Lilian Doerwald-Munoz 2, Ali Madooei 3, Samir Sahli 4, Shu-Chi A. Yeh1,5, Josiane Zerubia6, Raimond K. W. Wong2, Joseph E. Hayward2, Thomas J. Farrell 2 and Qiyin Fang1,4*

Journal name: www.frontiersin.org

Summary:

Skin Erythema, also called cutaneous inflammation, may be a symptom associated withdiverse cutaneous diseases [1] like psoriasis [2, 3] and acne lesions [4], also as with skin injuries like pressure sores and burns [5, 6].In additional extreme cases of thrombocytopenia, cutaneous inflammation is claimed to be a trigger for a lifethreatening hemorrhaging condition [7]. Although considered an adverse response, erythema is usually used as a feature to monitor the manifestation of skin diseases and the severity of treatment induced side effects. In radiotherapy , erythema reactions resulting from skin exposure to radiation also known as radiation

dermatitis may be a common limiting factor. Unchecked, severe radiation dermatitis can lead to intense pain, skin ulcers and tissue necrosis leading to treatment interruptions and reduced quality of life [8–11]. Early assessment of radiation induced erythema can facilitate more timely interventions; it's going to help reduce patient discomfort, increase compliance with treatment and improve treatment outcomes[10].

In the current study, the constructed skin contours display the temporal phases along with the spatial changes of the skin reaction intensity. The displayed contours, of different reactions, are attained via a sequence of steps. the primary step is grading the induced skin reaction by VA. This step is repeated for all consecutive imaging cycles for every volunteer. Following grading, the second step is computing the ratio of each erythematous reaction region with respect to the entire ROI. the ultimate step is plotting the graded contours of skin at the corresponding imaging cycle, which represents the temporal evolution as shown. The induced skin erythema intensity fades away gradually over time.

Conclusion:

In this study, we aimed to research the feasibility to use an AOTF-HSI system to quantitatively measure skin erythema. This pilot study on healthy volunteers with artificially induced erythema may be a checkpoint prior to apply the AOTF-HIS method in a clinical study on radiation treatment induced skin erythema. the present study results demonstrated that HIS can sufficiently classify skin erythema. Compared to diffuse reflectance spectroscopy or color photography, HSI acquires an entire set of wide-field images with full spectral information, which is shown to be important to skin erythema classification. although both spectral and color imaging techniques

approved the green region because the most discriminating region inerythema assessment; color imaging is sufficient for interpreting the green reflectance change with erythema alteration. additionally to skin reflectance analysis, supervised classification, LDA processing, contributed in clustering distinct level of induced skin erythema. This clustering technique yields a map for distributed changes of skin erythema. Training the developed LDA classifier with the bottom truth created an objective quantitative method of erythema assessment.

Paper 4: Skin Diseases Classification Using Hybrid AI Based Localization Approach

Publication year: 29 August 2022

Author name: Keshetti Sreekala, A. Yeshitla

Journal name: https://www.hindawi.com/

Summary:

The image processing techniques are involved within the given input data sets go through the preprocessing techniques. These techniques are handled by using the median filter during this proposed approach. The preprocessing techniques are helping to remove the noise within the images, the median filter removes the salt and therefore the pepper noise within the given input images. After the completion of the preprocessing technique, the segmentation process has been handled by reducing the dimensionality space in the entire image.The feature extraction within the entire image processing is considered as the dimensional reduction process, thus the whole dataset individual images are broken up into more manageable groups; in this paper, it's implemented that the given collections for skin diseases are extracted by using the

Structural CoOccurrence matrixes. This feature extraction plays an important role in image processing since the higher quality the dimensional quality reduction in the entire network system provides enhanced accuracy leads to the image classifications. This proposed approach provides an enhanced Convolutional Neural Network for the classification of the full scale images. the mixture of the feature extraction in SCM and therefore the classification in ECNN shows better accuracy when compared to the existing techniques.

Conclusion:

This paper implements that the structural Co-Occurrence Matrixes for feature extraction within the skin diseases classification and the preprocessing techniques are handled by using the Median Filter, this filter remove the salt and pepper noise within the Image processing; thus, it enhances the standard of the images, and normally, the skin diseases are considered because the risk factors in all over the world. Many researchers are involved to detect and stop the diseases earlier, thus we found this new approach from many existing approaches are involved within the classification of the accuracy results in the entire network, and therefore the comparison of our approach provides less amount of accuracy. This proposed approach provides 97% of the classification of the accuracy results while other existing model like FFT+SCM gives 80%, SVM+SCM gives 83%, KNN+SCM gives 85%, and SCM+CNN gives 82%.

Paper 5: A Novel Hybrid Deep Learning Approach for Skin Lesion Segmentation and Classification

Publication year: 18 April 2022

Author name: Puneet Thapar, Manik Rakhra , Gerardo Cazzato, and Md Shamim Hossain

Journal name: https://www.hindawi.com/

Summary:

On the idea of discussed data sets, an automatic skin lesion segment and intelligent classification models were designed and therefore the overall process of the proposed method is shown suggested model's whole operational procedure depicts the working architecture of the module that aids within the segmentation and classification of carcinoma from dermoscopic images of skin lesions. Preprocessing, K-means with GOA-based segmentation, SURF-based feature extraction, and SURFbased feature extraction are the five steps of the described model's operation and feature selection using GOA and CNN-based training also as classification. Initially, preprocessing step is administered using the hair removal technique with image quality enhancement that's named as the HR-IQ algorithm.The K-means algorithm with GOA is employed to segment the exact skin lesion region from the preprocessed dermoscopic images referred to as the region of lesion (ROL). When ROI segmentation is completed , the next, SURF-based feature extraction with feature selection process occurs using GOA as a feature optimization technique. Finally, CNN is employed to train and classify skin cancer from the dermoscopic image for automatic skin lesion and intelligent classification models into different classes. supported the given process of automatic skin lesion segment and intelligent classification model, each step is described intimately in the following sections of the research article.

Conclusion:

Results of the projected automatic skin lesion segment and intelligent classification model are examined in this part using three

different data sets. e number of images used by the projected model during segmentation and classification of skin lesion dermoscopic images is presented. ISIC-2018, PH-2, and ISIC-2017 are the three data sets used in the proposed research for training and testing. 1000 photos are gathered for training and testing in the ISIC-2017 and ISIC2018 data sets, with 60% of images (600 images) used for training and 40% used for testing. In PH-2 data set, 600 images are collected where 60% of images (400 image) are used for testing and 40% images are used for testing. In the proposed work, two classes of cancer are used that are melanoma and nonmelanoma. In this work, two subclasses of nonmelanoma are used that are common nevus and atypical nevus. Dermoscopy images are available that help in the diagnosisof skin lesions by the computer-aided diagnosis systems based on CNN, a deep learning approach that can automatically extract features inside patterns that help in efficient classification. In this study, utilizing the ISIC-2017, ISIC- 2018, and PH-2 data sets, images of skin lesions were classified. e model obtained a classification accuracy of 98.42%. To achieve this, various existing SI techniques are evaluated, and GOA is found to exhibit the best performance for skin lesion segmentation work. Further, SURF is taken for the feature extraction of the segmented regions and the CNN for classification of the skin lesion images into melanoma and nonmelanoma classes. e proposed work exhibits the best performance with 98.42% classification accuracy, 97.73% precision, MCC of 0.9704, and also outperformed the existing work by 6.12% accuracy. It was observed that the proposed approach improves the existing work with 9.21%, 5.78%, and 8.34% higher specificity, precision, and F-measure, respectively. e MCC of the existing work is 0.795 which is nearly 18% less than the proposed work. is shows that the approach has a broader scope for melanoma diagnosis, and in future work, higher success can be obtained by enhancing the model

and upgrading the data set and also further evaluated for more classes to address the practical challenges in healthcare and diagnosis.