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Algorithms for determining the Injuries: A Survey

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Abstract: Not only can wounds impair a patient's physical and mental well-being, but they also result in significant medical expenses. In the meantime, there may be a physician scarcity in some locations, and clinical exams may not always be accurate in diagnosing wounds. Accurate wound analysis is crucial for its diagnosis, management, and care. Nowadays, machine learning has become the most widely used method for wound image interpretation due to its rapid development in the fields of computer vision and medical imaging. This work examines the state-of-the-art deep learning research on wound image processing, encompassing segmentation, detection, and classification. Firstly, we examine the pre-processing techniques utilized in wound image analysis and assess the publicly available datasets from different studies. Secondly, different models applied to diverse machine learning tasks (identification, classification, and segmentation) and their applications in different types of wounds (e.g., burns, cuts, lacerations) are investigated. In conclusion, we address the difficulties encountered using the field of machine learning wound image analysis and offer a future direction for research and growth.

Keywords: Wound diagnosis, Computer Vision, Detection, Segmentation.

I. INTRODUCTION

As a ‘‘silent epidemic’’ , wounds not only cause severe physical pain to individual patients, such as background pain caused by the wound itself and operative pain from clinical interventions, but also introduce a certain degree of psychological impact, such as worry and anxiety in patients who suffer from traumatic pain, and in severe cases, it may lead to depression . In addition, since chronic wounds take a long time to heal, patients must undergo continuous care to prevent infection and the ongoing diagnosis and treatment of wounds place a significant financial burden on individuals as well as the society. This survey discusses the application that detects wounds and provides the necessary assistance to cure the wound. This application cuts down the financial burden and is also cost efficient.

II. LITERATURE SURVEY

1) The paper “A Survey of Wound Image Analysis Using Deep Learning: Classification, Detection, and Segmentation” by RUYI ZHANG1 , DINGCHENG TIAN 1 , DECHAO XU1 , WEI QIAN1,2 , AND YUDONG YAO 1 , (Fellow, IEEE), published on 28 July 2022, published in Institute of Electrical and Electronics Engineers. It introduces an approach to wound image analysis and provides review to healthcare professionals and researchers using deep learning application. This paper's literature review provides a variety of perspectives on the tools and techniques used in wound image analysis. This study highlights several applications, including classification, detection, and segmentation. In wound image analysis, wound classification is crucial since without it, a wound cannot be treated. The conventional method of diagnosing a wound involved assessing, analysing, and categorising the tissue state; however, because wound tissues vary widely and have complicated appearances, the outcomes were quite unpredictable. In order to classify the wound, the CNN model is thus employed to process the pixels rather than the full image. Detection and location of the wounded area were performed by a YOLOv5-based object detection algorithm trained on the dataset, where manual labelling of bounding boxes around the wound for each image on the training set.

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Wound segmentation is the basis of wound area measurement and tissue analysis, the pixel colour will be a gradient as the wound area extends into a healthy area which enhances the location information of the image in a deep neural network. Although certain drawbacks have to be acknowledged like there are very few publically available datasets, manual annotation of wound images is unstable which can lead to inaccuracies in detecting the wounds, and high implementation cost. In addition to all these challenges, the solutions presented in this survey paper help in the further development of wound image analysis.

2) The paper "A Mobile App for Wound Localization Using Deep Learning" M. Anisuzzaman, Yash Patel, Jeffrey Niezgoda, Sandeep Gopalakrishnan, Zeyun Yu, published on 30 May 2022, published in Institute of Electrical and Electronics Engineers. Introducing an innovative approach to wound localization, it developed an automated system to identify wounds in real-time from 2D photos using deep neural networks, specifically YOLOv3. This system, which is available as an iOS application, effectively recognizes wounds and tissue around them, which is essential for accurate diagnosis and treatment planning. It upgrades the functionality of the system by developing an iOS mobile application in order to provide accessibility to wound care solutions. In order to address data security issues, the future work will concentrate on integrating wound segmentation and classification functions. In this study, they used an iPad and DSLR cameras to gather a wound dataset, which were then labelled in YOLO format using the labelling tool. To improve the quality of the dataset, they used augmentations like blurring, flipping, and rotation. They utilized the Darknet-53 and VGG16 architectures to train the YOLOv3 and SSD models for wound localization and detection, respectively. Then performed testing and application detection durations on iOS devices, as well as time analysis by evaluating inference and suppression times for various image sizes. In order to accomplish this they implemented this by loading Darknet weights into Keras models and converting them to CoreML format for deployment.

3) The paper "Two-Step Deep Learning Framework for Chronic Wounds Detection Segmentation" Brayan Monroy, Jorge Bacca, Karen Sanchez, Henry Arguello, and Sergio Castillo, evaluate the performance of deep learning models introduces a system for tracking chronic wounds using deep learning. It can analyse RGB images taken with smart phones, making the process simpler and more accessible compared to complex setups. The system includes popular algorithms for medical image tasks like identifying wounds, separating them from the background, and measuring their size and shape tests show that the system is effective and accurate, achieving up to 84.5% precision. These matrices distinguish between true positive (TP), true negative (TN), false positive (FP), and false negative (FN) instances, helping calculate accuracy, which is the percentage of correctly classified samples. While accuracy is fundamental for model evaluation in balanced classes, it has limitations in imbalanced classes. Despite the proposed method, which absorb bands, outperforms state-of-the-art techniques. The paper highlights advantages such as clear problem division, reduction of unnecessary information, fully automatic segmentation, and accuracy. However, it lacks details on network specifics, insights into dataset characteristics, discussion of limitations, and future directions. Moreover, the integration of Generative Adversarial Networks (GANs) demonstrates the fusion of modern machine learning techniques with traditional medical practices, aiding in tracking wound evolution for patients, particularly those in rural areas where visual inspection by medical staff poses challenges.

4) The paper "Fully automatic wound segmentation with deep convolutional neural networks" Chuanbo Wang, Anisuzzaman, Victor Williamson, Mrinal Kanti Dhar, Sandeep Gopalakrishnan, and Zeyun Yu. They propose various methods to discuss about deep learning models such as CNN, VGG, and related ones. CNN (Convolutional Neural Network) is known for its high performance and efficiency in image processing, originally introduced in 1989 and it includes DCNN model, introduced techniques like GPU acceleration, and it has improved VGG classification by using numerous small convolution network and model parameters and implements nonlinear maps on models . Deep Lab replaced VGG's is a basic regular convolution with Atreus (tissue of body) of segmentation, and it followed by post-processing using Conditional Random Field (CRF). MobileNet used for depth-wise which is separable of convolution to the deepen of neural network and reduce image size effectively. R-CNN speed up the combined region proposal network (RPN) with R-CNN and it target is to detect the integrating regions, and it is classified in a single network. And also there are several object detection algorithms used in computer vision, with its strengths and weaknesses. YOLO, for instance, sacrifices some accuracy for faster computational speed when compared to the two-stage detection algorithm. YOLO is based on the GoogLeNet network structure and employs a separate CNN model for end-to-end object detection. It tends to generate fewer false positives in the background region compared to Faster R-CNN. Another algorithm, the Single Shot Multi-Box Detector (SSD), uses VGG-16 as its base model and incorporates additional convolution layers into the network. SSD utilizes multi scale feature maps for detection, allowing it to use relatively large feature maps to detect relatively small targets. This addresses YOLO's weakness in detecting small objects.
On the other hand, the Detection Transformer (DETR) takes a different approach by adopting the transformer as its core architecture. It treats target detection as an group prediction problem and performs better in detecting large objects.

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III. CONCLUSION

We studied various current applications and recent advances in deep learning applied to wound images, introduced models in different tasks, reviewed publicly available data set sand summarize various data pre processing approaches. Deep learning is still one of the active research areas in the field of wound image analysis. The reliable performance of deep learning in image classification, detection, and segmentation can effectively improve the diagnostic efficiency of health-care professionals. For areas with underdeveloped medical resources, it can compensate to a certain extent for the impact caused by the shortage of doctors. With the extensive cooperation of medical institutions, the rapid development of computer hardware and image acquisition equipment, and the continuous optimization of deep learning algorithms, deep learning has very promising prospect in the field of wound image analysis.

IV. FUTURE REASEARCH DIRECTION

In the future, the limitations on providing personalized treatment recommendations by using advanced image recognition technology, such as image processing , can facilitate the real-time medical resource location services, and seamless emergency response integration , offering cost-efficient and time-saving benefits. Additionally, by reducing delays in accessing care, minimizing the risk of complications, and promoting faster healing process.

REFERENCES

[1]. D. Voegeli, J. Posnett, P. Franks, K. Harding, M. Edmonds, C. Moffatt, and M. Clark, ‘‘Skin breakdown: The silent epidemic,’’ Smith Nephew Found., Hull, U.K., Tech. Rep., 2007.
[2]. K. Bechert and S. E. Abraham, ‘‘Pain management and wound care,’’ J. Amer. College Certified Wound Specialists, vol. 1, no. 2, pp. 65–71, 2009.
[3]. D. Upton, ‘‘Pain, wound care and psychology: The missing link,’’ Wounds U.K., vol. 7, no. 2, pp. 22–119, 2011.
[4]. R. C. Britt, L. J. Weireter, and L. D. Britt, ‘‘Initial implementation of an acute care surgery model: Implications for timeliness of care,’’ J. Amer. College Surgeons, vol. 209, no. 4, pp. 421–424, 2009.
[5]. R. F. Cubas, N. R. Gómez, S. Rodriguez, M. Wanis, A. Sivanandam, and C. A. Garberoglio, ‘‘Outcomes in the management of appendicitis and cholecystitis in the setting of a new acute care surgery service model: Impact on timing and cost,’’ J. Amer. College Surgeons, vol. 215, no. 5, pp. 715–721, 2012.
[6]. T. E. Serena, J. R. Hanft, and R. Snyder, ‘‘The lack of reliability of clinical examination in the diagnosis of wound infection: Preliminary communication,’’ Int. J. Lower Extremity Wounds, vol. 7, no. 1, pp. 32–35, Mar. 2008.
[7]. J. Faria, J. Almeida, M. J. M. Vasconcelos, and L. Rosado, ‘‘Automated mobile image acquisition of skin wounds using real-time deep neural networks,’’ in Proc. Annu. Conf. Med. Image Understand. Anal. Cham, Switzerland: Springer, 2019, pp. 61–73.

