Retraction

Retraction: Classification of Malignant Melanoma using Convolutional Neural Networks (J. Phys.: Conf. Ser. 1916 012070)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1
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Classification of Malignant Melanoma using Convolutional Neural Networks

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Abstract. Human cancer is one of the world's most deadly diseases caused due to genetic disruption of skin cells and several molecular mutations. Skin cancer remains the most predominant form of cancer in human beings. The major goal is to detect skin cancer in early stages by research and analyse it using various techniques such as segmentation and feature extraction. The diagnosis of malignant melanoma skin cancer is done by dermatologist by examining skin and physical biopsy to determine the accurate stage of melanoma. It is developed because of high accumulation of melanin in the dermis layer of the skin. ABCD law is used in along with dermoscopy technology to detect malignant melanoma skin cancer. Image Acquisition Technique, pre-processing, segmentation, distinguishing function for skin Feature Selection, which specifies lesion characterization and classification methods are all conducted in this project for melanoma skin lesion characterization. We used symmetry detection, border detection, colour and diameter detection, as well as feature extraction to remove texture based features using a digital image processing technique. The deep Neural Network was proposed here to characterize the benign or malignant stage.

1. Introduction

A skin lesion is an irregular development or appearance of human skin in comparison to the skin surrounding it. One of the most common causes of a skin lesion is inflammation in or on the skin. A wart is an example and they are affected by a virus that is spread by contact [1]. Primary and secondary skin lesions are the two most common forms. Blisters, Macules, Nodules, Papules, Pustules, Rash, and Wheals are some of the other types. Primary skin lesions that have been irritated or manipulated may result in secondary skin lesions. Crust, Ulcer, Scale, Scar, and skin atrophy are the most common secondary skin lesions. Skin lesions are divided into two types such as benign and malignant. The CAD system can be given dermoscopic images containing lesions for identification and classification of the skin lesion [2]. In a CAD system like this, accurate segmentation of skin lesions is critical. Precise segmentation improves the CAD system's precision, lowering the number of incorrect classifications caused by inaccurate segmentation. The first step in image processing applications is to pre-process the images. It ensures that the image is improved in comparison to the input image, resulting in the segmentation results that are desired. Due to the difficulty of segmenting malignant skin lesions, various pre-processing techniques that can be used before segmentation of dermoscopic images containing...
malignant skin lesions are investigated [3]. Until segmentation, common pre-processing techniques such as hair removal, median filtering, and contrast stretching are combined with Histogram Specification on dermoscopic images containing malignant skin lesions. Skin cancer is more than the world's total number of breast, lung, and colon cancers put together. Every 57 seconds, a person is affected by Melanoma and becomes a survivor. Early detection and detection of skin cancer, as with any other form of cancer, is the most promising indication of a patient's full recovery. Early detection of skin cancer in the population results in a 94 percent ten-year survival rate. However, as the cancer progresses and reaches the latter stages, the survival rate decreases dramatically [4]. When Melanoma is diagnosed in its final stages, the ten-year survival rate is a pitiful 15%. Early detection of skin cancer in the general population, on the other hand, is a costly endeavour. It's difficult to tell whether a skin lesion is benign or malignant since the lesions look so similar. The detection of the lesion's type necessitates a thorough examination [5]. To research the lesion more closely, a special system called a dermatoscope is used to take an image. Dermatoscopes are unfortunately costly and not commonly available among dermatologists. The visual similarity between skin diseases is one of the challenges of visual screening. Significant progress has been made in the field of computer vision over the last few years. It is now possible to distinguish between clinically related skin conditions thanks to the development of new algorithms. These algorithms do not require images to be captured using specialized instruments such as dermatoscopes, and can be used on images captured using regular cameras [6]. We present a method for pre-processing and segmenting lesions, extracting features from the segmented lesions, and training an artificial neural network to classify the lesions into their appropriate categories in this paper. We look at three different types of benign and malignant lesions. Melanocytic Nevi, Seborrheic Keratoses, and Acrochordon are examples of benign lesions, while Melanoma, Basal Cell Carcinoma (BCC), and Squamous Cell Carcinoma are examples of malignant lesions (SCC) Fig-1.

![Visual Similarities between Melanoma and Benign Lesions](image.png)

**Figure 1.** Visual Similarities between Melanoma and Benign Lesions.

2. **Process Description**

2.1. **Image Processing**

The manipulation of images by a digital machine is referred to as digital image processing. It has been tried on a variety of pictures with varying degrees of success throughout its short history. Myths, misconceptions, misunderstandings, and misinformation abound throughout the world of digital image processing, as they do in other glamorous areas. It covers a wide range of topics such as optics, electronics, mathematics, photography, graphics, and computer technology. A number of factors point to a bright future for digital image processing. The falling cost of computer equipment is one of the major factors. A number of recent technical advances aim to boost digital image processing even further. These include parallel processing, which is enabled by low-cost microprocessors, as well as the use of
charge coupled devices (CCD) for digitization, storage during processing, and display, as well as massive, low-cost image storage arrays Fig-2.

2.2. Digital image processing

\[ \text{Figure 2. Digital image processing steps.} \]

2.3. Image Acquisition
Picture acquisition entails the capture of a digital image, which necessitates the use of an image sensor as well as the ability to digitize the signal provided by the sensor. The sensor may be a monochrome or colour TV camera that takes a 1/30 second picture of the issue domain. It's also possible that the image sensor is a line scan camera, which generates a single image line at a time. In that case, the object's motion past the line. A two-dimensional image is generated by the scanner. An analogue to digital converter digitizes the outputs of a camera or other imaging sensor if they are not in digital form.

2.4. Image Enhancement
Image enhancement is one of the most basic and appealing aspects of digital image processing. The main goal of enhancement techniques is to bring out hidden information and emphasize specific aspects of an image. Increasing the contrast of an image to improve its appearance is an example of an enhancement technique. It's important to remember that image enhancement is a highly subjective area.

2.5. Image restoration
Image restoration is empirical, relying on statistical or probabilistic models of image loss, while enhancement is contextual, relying on human subjective expectations for the constituents of a successful enhancement outcome.

2.6. Color image processing
Color is an important descriptor that also simplifies object recognition and extraction from a scene, and humans can distinguish thousands of colour shades and intensities, compared to just a few hundred shades of gray. When performing manual image analysis, the second factor is especially significant.

2.7. Segmentation
The division of an image into its constituent parts or objects is referred to as segmentation. Autonomous segmentation is the most challenging techniques of digital image processing. The method is carried out by a strong segmentation approach, which leads to an effective solution of imaging problems that involve individual object identification. Here the digital images are partitioned into multiple segments which help in locating the boundaries of objects Fig-3 a,b,c.
2.8. Image Compression
Compression of digital images is a technique for reducing the amount of data required to display a digital image. The reduction method is built on the idea of removing redundant data. This yields a statically uncorrelated data set from a 2D pixel array from a mathematical standpoint. Data redundancy is a numerically quantifiable phenomenon, not an abstract concept. Educational and business records, medical images produced by computer tomography (CT), magnetic resonance imaging (MRI), and digital radiology, motion pictures, satellite images, weather maps, and geological surveys, among other things, all require image storage Fig-4.

2.9. Image Compression Types
There are two types of compression techniques in image compression.

- **Lossy Image compression**
- **Lossless Image compression**

Compression ratio:

\[
\text{Compression ratio} = \frac{B_0}{B_1}
\]

- $B_0$ - number of bits before compression
- $B_1$ - number of bits after compression
2.9.1. Lossy Image compression
PGF was created with the intention of quickly and gradually decoding lossy compressed aerial images. Furthermore, lossy compressed images are normally easier to decode than lossless compressed images.

2.9.2. Lossless Image compression
The most appropriate amount of data reduction is lossless image compression. As opposed to the lossy format, it has a low compression ratio. The methods used in Lossless Image Compression are made up of two separate operations. The first is to create an alternate image representation with less inter-pixel redundancies, and the second is to code the representation to remove coding redundancies. Medical imaging, company papers, and satellite images are examples of Lossless Image compression applications.

2.10. Thresholding
The most basic method of image segmentation is thresholding. In this method gray scale image is obtained from binary images. This technique replaces each pixel in an image with a black pixel. Automatic thresholding works better when there is a decent backdrop to foreground contrast ratio and the image must be shot in good lighting conditions with minimal glare.

3. Design of Proposed System

3.1. Convolutional Neural Networks
Bionic convolutional neural networks are suggested as a solution to this problem because they minimize the number of parameters and adapt the network architecture directly to vision tasks. Convolutional neural networks are made up of layers that can be classified according to their functions fig-5.

![Figure 5. Convolution Layer Architecture.](image-url)
3.2. Convolution Layer

The inputs are subjected to a 2D convolution operation. Across the "channels," the "dot goods" between weights and inputs are "integrated." The weights of the filters are spread through receptive fields fig-6.

3.2.1. Activation Layer

Used to increase non-linearity of the network without affecting the convolution layers. Preferring ReLU results in faster training. Leaky ReLU addresses the problem of vanishing gradient.

3.2.2. Softmax

It's a kind of activation layer that appears at the end of the FC layer outputs and acts as a fancy normalizer (Normalized exponential function) to generate a discrete probability distribution vector. When combined with cross-entropy loss, it is extremely useful.

3.2.3. Pooling Layer

Pooling layers apply non-linear down sampling of activation maps, while convolutional layers have activation maps. The trend in pooling is to use smaller filter sizes.

3.2.4. FC Layer

It's a normal neural network that maps extracted visual features to desired outputs and can be thought of as the final learning process. Adaptive to classification or encoding functions in most cases.

Figure 6. Convolution Layer.
common output is a vector, which is then fed into softmax as input to reflect classification trust. These outputs can be used as a “bottleneck” as well fig-7.

3.3. Diagram of Architecture:

![Diagram of Architecture](image)

**Figure 7.** Diagram of Architecture.

4. Results

The below are the results obtained when testing a benign and malignant skin image. Figure8 and Figure9 are the outputs obtained for the benign and malignant skin images respectively.

**Figure 8.** Benign Skin Output.
5. Conclusion
To minimize skin cancer, people must have access to the necessary information which includes options for sun protection. Policies must promote these efforts and youth must be shielded from the dangers of indoor tanning. Sufficient investments in skin cancer research and surveillance are also needed. It would be a difficult job to achieve those objectives. It takes commitment, creativity, expertise, and the coordinated efforts of many partners in many different sectors to deter crime. Many of these collaborators are already enthusiastically involved, but they will need more cooperation and resources to expand their scope. The methods outlined in this paper are the next steps. We must move quickly to halt the global spread of skin cancers.

References
[1] Yogesh Angal; Anita Gade, Development of library management robotic system, 2017 International Conference on Data Management, Analytics and Innovation (ICDMAI).
[2] Benjamin Meunier, Library Technology and Innovation as A Force For Public Good A Case Study From UCL Library Services, 2018 5th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS).
[3] Haldorai, A. Ramu, and S. Murugan, Social Aware Cognitive Radio Networks, Social Network Analytics for Contemporary Business Organizations, pp. 188–202. doi:10.4018/978-1-5225-5097-6.ch010
[4] R. Arulmurugan and H. Anandakumar, Region-based seed point cell segmentation and detection for biomedical image analysis, International Journal of Biomedical Engineering and Technology, vol. 27, no. 4, p. 273. 2018.Finlayson, G.D. et al. (1998), Comprehensive Colour Normalization. Proc. European Conf. on Computer Vison (ECCV), vol. 1, pp.475–490.
[5] Jegou, S. et al. (2017), The One Hundred Layers Tiramisu: Fully Convolutional Dense Nets for Semantic Segmentation, IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW).