Skin Cancer Classification Implementing Convolutional Neural Networks

Clasificación de Cáncer de Piel Implementado Redes Neuronales Convolucionales

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Abstract

The use of image processing to strengthen medical diagnostics in the medical field is becoming more and more common. In the dermatology area it is used to carry out the identification and monitoring of lesions caused by skin cancer. One of the most used machine learning methods in the state of the art for this problem is the convolutional neural networks. In this work we propose a methodology to perform the automatic classification of images with skin cancer corresponding to the HAM10000 database, where we work with the types of cancer Benign Keratosis, Melanoma, Melanomic Neves, the implementation of a neural network was performed, complemented with several filters to preprocess the images, obtaining results higher than 92% accuracy. The results obtained compete with those reported by several authors in the state of the art and allow us to see the feasibility of the proposed methodology.

Palabras clave: CNN; skin cancer; HAM10000.

Introduction

Currently we can find a large number of works that implement convolutional neural network (CNN) related to skin cancer, in this field of action, the work of (Esteva et al., 2017) carried out in the accompaniment of a group of professionals to verify the behavior of CNN, as a tool to expand the scope of dermatology professionals in the detection of skin cancer, despite the CNN model implemented, the author reaches 72.1% in its processing. In the same way (Haenssle et al., 2018) implements Google's Inception V4 architecture, although the initially implemented set is 300 set with samples of melanomas and melanocytic nevi of different subtypes, the results obtained are equivalent to 88.9%, a comparison made with 58 dermatologists, including 30 experts. Likewise (Hekler et al., 2019) demonstrates how the use of CNNs contribute to diagnostic support in the detection of skin cancer, with an average precision equivalent to 90.21% in the results, well above the best result obtained by the group of professionals from 13 university hospitals in Germany. Likewise (Maron et al., 2019), who makes a comparison of the implementation of his CNN with the analysis of 112 dermatologists, evidencing the effectiveness of its implementation, which reached a specificity of 98.8%. The implementation of the data processing, the system has been previously evaluated with 7 types of cancer contained at the HAM10000, but since there is a great inequality between the types of samples, it is necessary to carry out a balancing or, as in this case, to implement CNN with the data samples containing a significant number of images, in this case the cancer types Benign Keratosis (BKL), Melanoma (MEL) and Melanomic Neves (NV).

Proposed Methodology

The implementation of a CNN in the detection of skin cancer, in this specific case in the classification of skin cancer in types BKL, MEL, NV, with images taken from the HAM10000, in this processing non-duplicated images are taken into account existing in the data, in the implementation of the data, the training with this sample is defined, taking into account that the number of non-duplicated images contained in the data is 7472 images, and of these the MEL group contains 616 images, the which represents a considerable number to train, this is due to the fact that the bcc group contains 327 non-duplicated images, which is why only this sample is taken into account for training, here the selected group (BKL, MEL, NV) are chosen in a way randomize 616 images and have 80% (493 images) for training and 20% (123 images) for testing.

This procedure applies a CNN containing convolutions with 16, 32, and 64 filters, maxpooling is applied between the convolutions, and the generation of 3 dense output layers allows classification (figure 1).

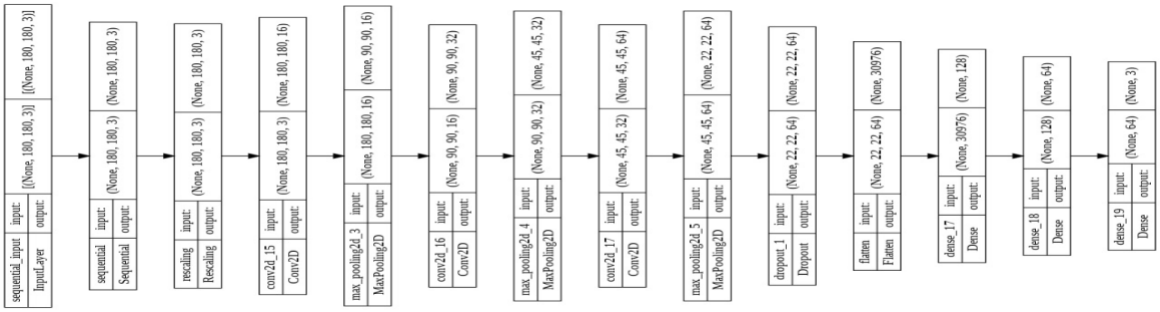

Figure 1. Model based on CNN implementation

Results and conclusions

In the implementation based on CNN using the images of HAM10000 data, with the samples selected in the types of cancer BKL, MEL, NV, and the implementation with the number of images selected, a dropout is performed to avoid overfitting, additional so that the sample recognizes the image at different angles, that is why the number of images is increased to improve the effectiveness of the model, which reaches an accuracy of 92.77% and accuracy assessment of 89.73%.

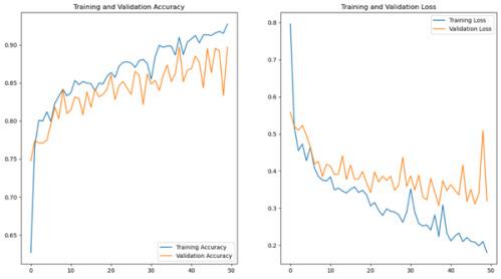

Figure 2. Results

In this sense, the implementation made to the CNN allows to demonstrate the results obtained by implementing a system with a sample of balanced training images between the types, in addition to the adequate adjustment of the epochs, as well as avoiding underfitting in the training of the model. Allows to obtain optimal results in the implementation of the CNN.

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