10-10-2023

Problem Statement

The problem statement of the paper is to develop a hybrid method for melanoma skin cancer detection that can be used to examine any suspicious lesion. The proposed system relies on combining the prediction of three different methods using majority voting.

Motivation

- Melanoma is the deadliest form of skin cancer, but it is highly curable if detected early.
- Early detection is challenging because melanoma lesions can be difficult to distinguish from benign lesions.
- Deep learning and classical machine learning techniques have been shown to be effective for melanoma detection.
- A hybrid method that combines the predictions of multiple methods can improve accuracy.
- Developing a more accurate and reliable skin cancer detection system could help save lives.

Objective

The objective of this paper is to introduce a hybrid method for melanoma skin cancer detection that can be used to examine any suspicious lesion.

In more detail, the authors of the paper wanted to develop a method that could accurately detect melanoma skin cancer, even in cases where the lesions were difficult to distinguish from benign lesions. They also wanted a method that could be used to examine any suspicious lesion, regardless of its size, shape, or location.

The authors proposed a hybrid method that combines the predictions of three different methods: a deep learning method, a classical machine learning method, and a rule-

based method. They found that their hybrid method outperformed each individual method, and that it was able to accurately detect melanoma skin cancer in a variety of cases.

The authors believe that their hybrid method could be used to develop a more accurate and reliable skin cancer detection system. This could help to improve early detection of melanoma skin cancer, which could lead to better patient outcomes.

Methods used for preprocessing the dataset

- **Color enhancement technique based on the blue component of the RGB color channels:** This method enhances the contrast of the image and makes the lesion more visible.
- **Hair removal using 2-D derivatives of Gaussian (DOG) filter and thresholding:** This method removes hair from the image, which can interfere with the detection of the lesion.
- **Skin lesion segmentation using thresholding and morphological snakes:** This method segments the skin lesion from the rest of the image. This is an important step because it allows the model to focus on the lesion and ignore the surrounding tissue.

ML and DL techniques used to predict skin cancer

- **K-nearest neighbors classifier:** This is a simple but effective machine learning algorithm that classifies new data points based on the similarity to their nearest neighbors in the training data.
- **Support vector machine classifier:** This is a more complex machine learning algorithm that finds a hyperplane in the data that separates the different classes.
- **Convolutional neural network:** This is a type of deep learning algorithm that is well-suited for image classification tasks. It learns to extract features from images that are useful for distinguishing between different classes.

The authors of the paper found that the convolutional neural network outperformed the other two methods on the melanoma skin cancer detection task. However, they also found that combining the predictions of all three methods using majority voting further improved performance.

This suggests that a hybrid approach that combines the predictions of multiple machine learning and deep learning algorithms can be more effective than any individual algorithm.

THE ACCURACY VALUES OF USING THE DIFFERENT METHODS

- **KNN:** 57.3%
- **SVM:** 71.8%
- **CNN:** 85.5%
- **Majority voting:** 88.4%

As you can see, the hybrid method of majority voting outperforms each individual method. This suggests that combining the predictions of multiple methods can improve the accuracy of melanoma skin cancer detection.

It is also worth noting that the overall accuracy of 88.4% is quite good. However, it is important to keep in mind that the accuracy of any machine learning model can vary depending on the quality of the data used to train it and the specific task that it is being used for.