Skin Lesion Segmentation

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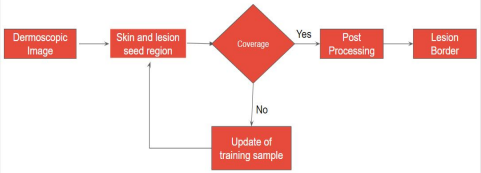
Abstract

Automatic segmentation of skin lesions is a crucial step in Computer Aided Diagnosis systems for melanoma detection. The most dangerous cancer, melanoma is very difficult to detect. The proposed algorithm in the project uses the convolutional neural networks (U-Net) on the ISIC dataset. The accuracies and dice coefficients are then calculated.

Introduction

- Skin lesion segmentation process is an image segmentation process for detection of the skin cancer.
- The dermatologists used to physically examine the skin to identify the skin lesions.
- This way was inefficient because it led to many false positives or false negatives.
- Therefore, a deep learning based model which uses CNN U-Net architecture and dice coefficient as a loss function was incorporated to make this process more efficient.

Methodology

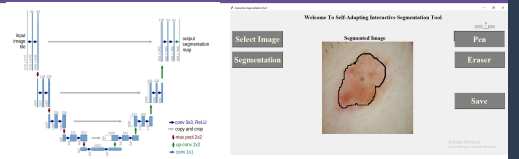


We have used dice loss as loss function.
Dice Function :

$$D = \frac{2\sum_i^N p_i g_i}{\sum_i^N p_i^2 + \sum_i^N g_i^2}$$

It only addresses the imbalance problem between foreground and background yet overlooks another imbalance between easy and hard examples that also severely affects the training process of a learning model

The network consists of a contracting path and an expansive path, which gives it the u-shaped architecture. The contracting path is a typical convolutional network that consists of repeated application of convolutions, each followed by a rectified linear unit (ReLU) and a max pooling operation. During the contraction, the spatial information is reduced while feature information is increased. The expansive pathway combines the feature and spatial information through a sequence of up-convolutions and concatenations with high-resolution features from the contracting path



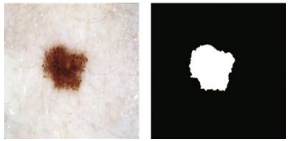
The GUI is developed using python and tkinter.
The procedure of the application:

- Select the image using image segmentation button.
- Using Segmentation feature we get the boundary of the skin lesion image.
- User can edit the contour of skin lesion using pen and eraser tool if it was predicted incorrectly.

Results and Conclusion

We have successfully created the application with deep learning.

- Training Accuracy is 0.93
  Loss : 0.3588
- Dice loss Function is used.
- Intersection-Over-Union is a common evaluation metric for semantic image segmentation. The intersection over union value on test dataset is 0.712



This figure of input and output of dermoscopy image

We found that dice coefficient with ADAM optimiser is performing better as compare cross entropy.

Acknowledgements

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