Improved YOLO V3 Network for Basal Cell Carcinomas and Bowen's Disease Detection

Jiantao Zhang (✉ zhangjt@shu.edu.cn)

Shanghai University

Yun Huang

Shanghai University

Xiaobo Zhang

Shanghai University

Yan Xue

Naval Medical University

Xinling Bi

Naval Medical University

Zhuo Chen

Shanghai Jiao Tong University School of Medical

Research Article

Keywords: Object detection, YOLO, Digital pathology, Basal cell carcinoma, Bowen's disease

Posted Date: June 7th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-541739/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

The pathologists' workload is very heavy because they have to identify and diagnose a large number of histological images in daily work. So, there is an urgent need to develop a method for detecting and identifying skin cancer. Basal cell carcinomas (BCC) and Bowen's disease (squamous cell carcinoma in situ) are common malignant skin cancers. In this paper, we focus on the study of YOLO detection model in object detection, and use the YOLOv3 model to detect and identify BCC and Bowen disease. The results show that the model can effectively detect most lesions. Through the structural analysis of the YOLOv3 model algorithm, it is found that the number of convolutional feature maps in some layers' changes drastically. So, a new convolutional layer is added to gradually reduce the number of feature maps, and then an improved YOLOv3 algorithm is proposed. The improved algorithm is used to detect the lesions of the BCC and the Bowen's disease. The results show that the improved model algorithm has better detection performance. Under the condition of threshold value of 0.7, the recognition accuracy of BCC and Bowen's disease is 91.3% and 90.9% respectively.

Full-text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

Figure 1

Histologic image samples of normal skin

Figure 2

Histologic image samples of BCC

Figure 3

Histologic image samples of Bowen's disease (SCC in situ)

Figure 4

Labeling of histopathological pictures of skin cancer. (a) labeling of BCC; (b) labeling of Bowen's disease

Figure 5

In the YOLOv2 algorithm, each grid generates 5 anchor boxes

Figure 6

Schematic diagram of detection using improved YOLOv3 model

Figure 7

Schematic diagram of test results for BCC

Figure 8

Schematic diagram of test results for Bowen's disease

Figure 9

PR curve of YOLOv3 model in BCC and Bowen's disease detection experiment

Figure 10

PR curve of the improved YOLOv3 model in the detection experiment of BCC and Bowen's disease