

# Abstract

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## **Early esophageal adenocarcinoma detection using deep learning methods**

**Purpose** This study aims to adapt and evaluate the performance of different state-of-the-art deep learning object detection methods to automatically identify esophageal adenocarcinoma (EAC) regions from high-definition white light endoscopy (HD-WLE) images. **Method** Several state-of-the-art object detection methods using Convolutional Neural Networks (CNNs) were adapted to automatically detect abnormal regions in the esophagus HD-WLE images, utilizing VGG'16 as the backbone architecture for feature extraction. Those methods are Regional-based Convolutional Neural Network (R-CNN), Fast R-CNN, Faster R-CNN and Single-Shot Multibox Detector (SSD). For the evaluation of the different methods, 100 images from 39 patients that have been manually annotated by five experienced clinicians as ground truth have been tested. **Results** Experimental results illustrate that the SSD and Faster R-CNN networks show promising results, and the SSD outperforms other methods achieving a sensitivity of 0.96, specificity of 0.92 and F-measure of 0.94. Additionally, the Average Recall Rate of the Faster R-CNN in locating the EAC region accurately is 0.83. **Conclusion** In this paper, recent deep learning object detection methods are adapted to detect esophageal abnormalities automatically. The evaluation of the methods proved its ability to locate abnormal regions in the esophagus from endoscopic images. The automatic detection is a crucial step that may help early detection and treatment of EAC and also can improve automatic tumor segmentation to monitor its growth and treatment outcome.