UNIVERSITY OF COPENHAGEN

Pancreas segmentation in abdominal CT scans

Sepideh Amiri

Department of Computer Science

Contact Information:
Universitetsparken 5
2100 København Ø

Phone: +45 81912276
Email: sepideh.amiri@di.ku.dk

Abstract

For automatic organ segmentation from CT-scanned images, deep learning has been frequently used. However, segmentation accuracy on some minor organs (such as the pancreas) is occasionally subpar, owing to deep networks being easily distracted by the complex and varied background region, which takes up a major portion of the input volume. We propose two phase approach to deal with this problem. We train two-stage U-Net using different input volume.

Introduction

In recent years, due to the remarkable development of deep neural networks, we have witnessed rapid progress in both medical image analysis and computer-aided diagnosis. The pancreas is one of the most difficult organs to segment due to its unique shape, position, and size in each individual. Various deep learning algorithms are used to segment the pancreas among organs in the abdominal region, due to the advancement of machine learning. To deal with this problem, we propose a two steps approach for pancreas segmentation.
In this study, pancreas segmentation is performed using the U-Net model, which is one of the convolutional neural networks (CNN) models.

Materials and Methods

Pancreatic segmentation performed on the Pancreas CT data set from The Cancer Imaging Archive (TCIA) database, which contains computed tomography images of 80 patients.
Due to the fact that accurate pancreas segmentation can be challenging for medical image analysis, we proposed a fully automated two stage framework for pancreas segmentation based on convolutional neural networks (CNN).
In the first stage, a U-Net is trained for the down-scaled 3D volume segmentation. Then a center of the mass from candidate region covering the pancreas is extracted from the estimated labels. Next, the difference between the two centers of mass of the predicted and original label is calculated and cut as a margin around the center of the pancreas. This cropped area will be the input to the next step.

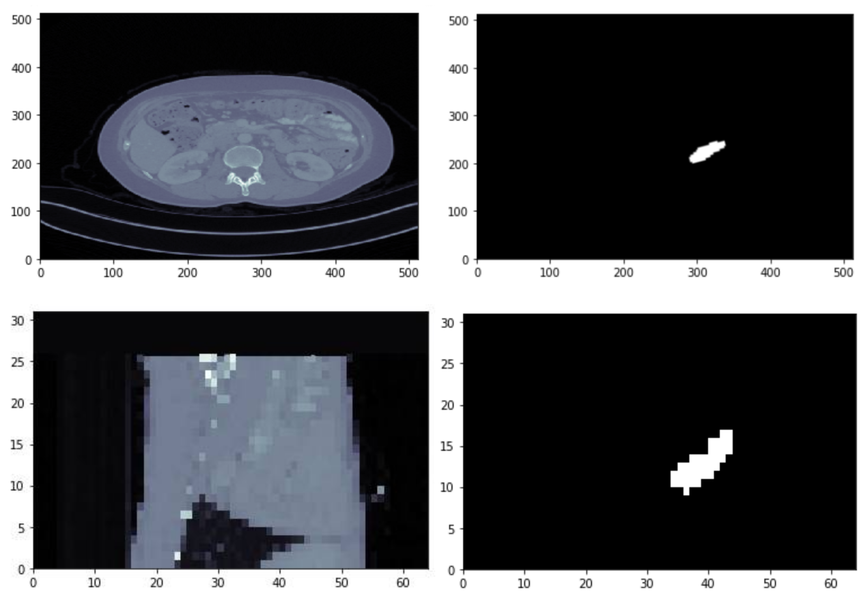
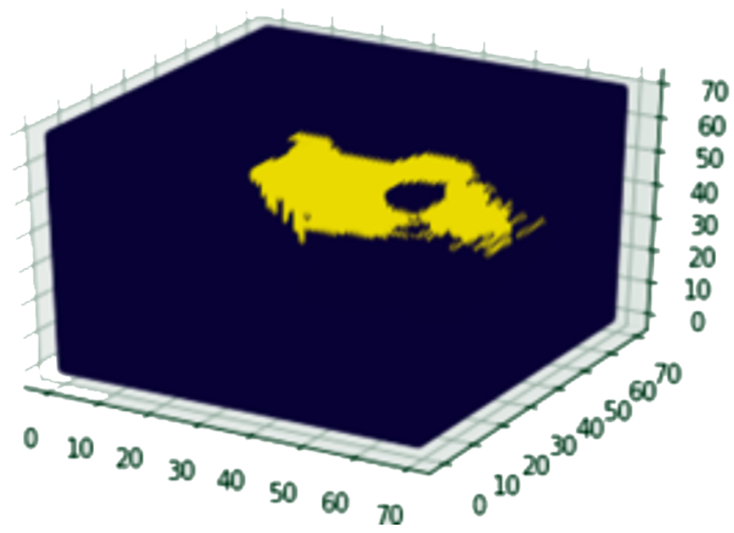


Figure 1: Top images are original CT slice and label with (512, 512) size, bottom images are CT slice and label after rescaling (64, 64) and pr-processing.



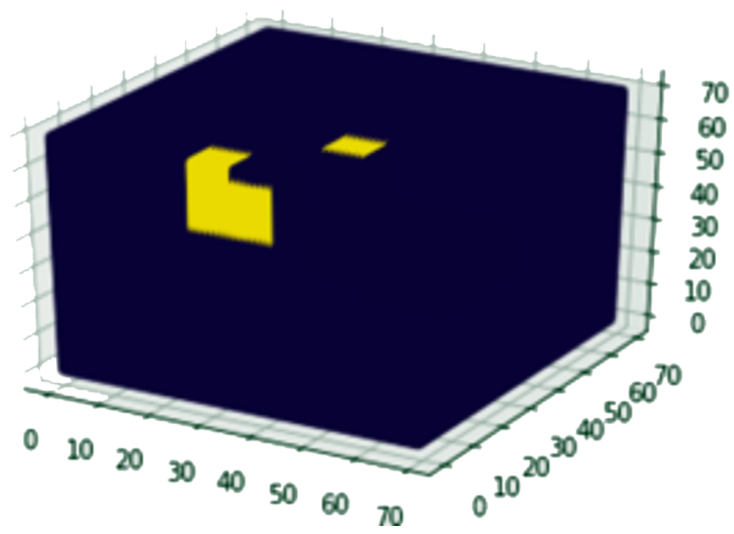


Figure 2: Top is the Original crop with predicted center of mass ± margin, below is the predicted crop with their center of mass ± margin.

Forthcoming Research

In the next stage, another 3D U-Net will train on the candidate region generated in the first stage. We will evaluate the performance of the proposed method on the the pancreatic CT data of Rigshospitalet, and evaluate its superiority over other state-of-the-art 2D and 3D approaches for pancreas segmentation in terms of dice-sorensen coefficient (DSC) accuracy in testing.

Refrences

Çiçek Ö, Abdulkadir A, Lienkamp SS, Brox T, Ronneberger O. 3D U-Net: learning dense volumetric segmentation from sparse annotation. InInternational conference on medical image computing and computer-assisted intervention 2016 Oct 17 (pp. 424-432). Springer, Cham.