

COMP PROJECT:

Liver Tumor Segmentation

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Agenda

1. Project Idea
2. Background
3. Methods
4. Performance measurement
5. Originality
6. Live demo

Project Idea

- Participate at Liver Tumor Segmentation (LiTS) Challenge
https://competitions.codalab.org/competitions/17094#learn_the_details

Minimum:

- Beat 100st place
- Detect:
 - *lesions with dice score of 60%*
 - *liver with dice score of 90%*
 - *tumor burden with RMSE 0.04*

Ideal:

- Beat the current 1st place
- Detect:
 - *lesions with dice score of 80%*
 - *liver with dice score of 97%*
 - *tumor burden with RMSE 0.02*

Background

Dataset:

- LiTS-Challenge Dataset (training and test data)
 - <https://drive.google.com/drive/folders/0B0vscETPGI1-Q1h1WFdEM2FHSUE>
 - <https://drive.google.com/drive/folders/0B0vscETPGI1-NDZN3puMIZiNWM>

Paper:

- U-net, <https://arxiv.org/abs/1505.04597>
- Deep learning and level set approach for liver and tumor segmentation from CT scans,
<https://aapm.onlinelibrary.wiley.com/doi/epdf/10.1002/acm2.13003>

Code:

- U-net applied on [3D-IRCADb](https://github.com/zhaohandd/Unet-liverCT), <https://github.com/zhaohandd/Unet-liverCT>
- U-net applied on LiTS
 - <https://www.kaggle.com/arunasna/liver-segmentation-with-fastai-v2/notebook>
 - <https://github.com/FelixGruen/tensorflow-u-net>

Methods

Data Processing:

- Convert given NIfTI to another format
- Liver Detection:
 - *Median filtering*
 - *Intensity windowing*
- Tumor Detection:
 - *edge enhancing diffusion (EED) filtering*
 - *Intensity windowing*

Semantic Segmentation:

- Fully Convolutional Network-based
 - *U-net and its family, <https://github.com/ShawnBIT/UNet-family>*

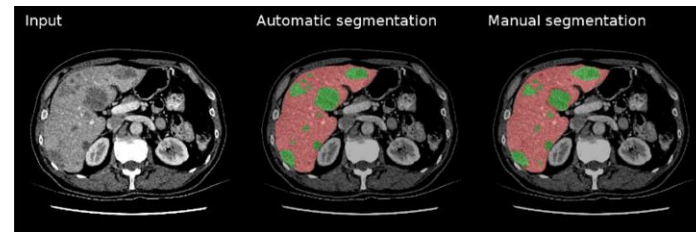
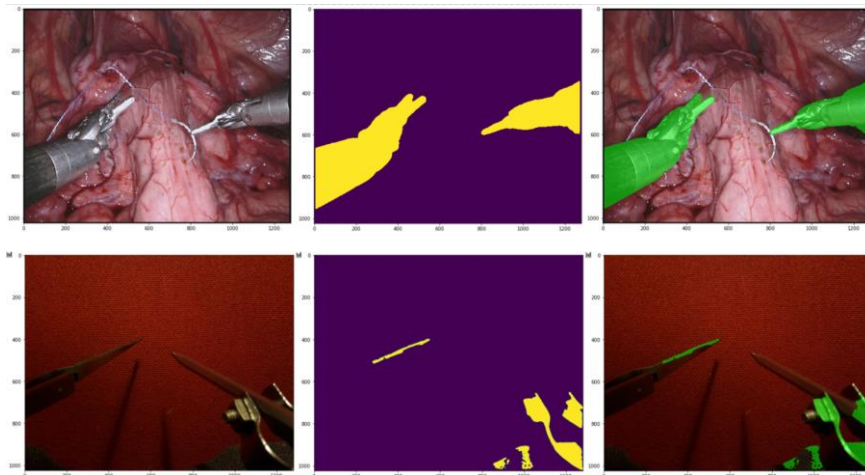
Performance measurement

- Overall segmentation accuracy
 - Dice score for liver and lesion segmentation
- Tumour Detection
 - Root-mean-square error (RMSE) for tumour burden
- Training and running time
 - Does not need to be real time

Originality

- Not doing something new, rather trying to improve previous work

Live-demo



- <https://github.com/ternaus/robot-surgery-segmentation>