



Deep Learning-based segmentation of vertebrae in Magnetic Resonance volumes

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

The goal of the project is to provide a Deep Learning-based automatic segmentation pipeline for the vertebrae in MR volumes.

Background and Motivation

Segmenting organs and structures consists in delineating them in medical images in order to extract information required to evaluate important factors during and follow-ups such as the extent or the progression of the disease. However, segmenting organs manually is a difficult and time consuming task for medical doctors, which is prone to inter- and intra-observer error. Therefore automatic methods to do segmentation of medical images are of high importance. The most common approach is to employ deep Neural Networks (such as U-Net) trained on previously annotated dataset [1]. The goal of this project is to develop a Deep Learning-based pipeline for vertebrae segmentation and labeling (i.e. assigning to each vertebra its name) in MR volumes.

Student's Tasks Description

The student will train a baseline neural network architecture, among those available, with a public dataset of MR volumes. Depending on the performance of the baseline, more complex architectures (such as [2]) may be taken into consideration to improve the results. As the final step, the network will be tested on a small in-house dataset to evaluate the performance of the network on a different distribution of data.

Technical Prerequisites

The student should have experience in Python programming. Theoretical and/or practical knowledge of Deep Learning and Pytorch is helpful. Experience with Polyaxon and Weights & Biases [3] is beneficial.

References

- [1] <https://link.springer.com/article/10.1007/s10278-019-00227-x>
- [2] https://link.springer.com/chapter/10.1007/978-3-030-00937-3_74
- [3] <https://wandb.ai/site>