UNIVERSITÉ DE LYON

CREATIS

Medical Image Segmentation and Registration with Deep Learning

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Internship 2019 - Master II

Keywords   Image registration, Image segmentation, Deep Learning

Context   Machine learning is a powerful strategy for medical image processing, providing accurate results on problems that are too challenging to model analytically. Deep Learning based Neural Network approaches are currently revolutionizing this area. For example they have produced state-of-the-art methods for medical image segmentation [1,2], image registration [3,4], and image synthesis. As annotated medical datasets are typically small, one of the challenges is to be able to train a sufficiently rich network robustly from a limited amount of data.

Objectives   The intern will be responsible for implementing and refining some new methods for medical image registration and segmentation using deep learning. We will use brain MR images data for which we have several annotated or non annotated datasets. Some of the key limitations of current approaches will be tackled using novel network architectures and specific data augmentation methods. The work is part of a collaboration between CREATIS [1] (Lyon) and LJK [2] (Grenoble).

The intern will have access to the GPU ressources of both CREATIS and tne CC IN2P3.

The method will be integrated into our existing code [2] developed using Python and PyTorch http://pytorch.org.

This internship can open opportunities as phd candidate or deep learning expert in industry.

Application   The candidate is expected to have a M1 in either machine learning, image processing or applied mathematics. We are seeking a serious candidate who can work semi-autonomously with:

- strong programming skills, including experience with python
- good knowledge of machine learning, deep learning
- knowledge of image processing (image segmentation, registration and warping)
- methods, writing ability

Interested candidates will send any relevant documents (cover letter, CV, letters of reference, transcripts, previous internship reports, code sample,...) to:michael[dot]sdika[at]creatis[dot]insa-lyon[dot]fr and triggsw[at]univ-grenoble-alpes[dot]fr.

Location, Duration

- CREATIS lab, Lyon, France
- 6 months
- ˜550 €/ months

References

1. Ronneberger *et al*, U-net: Convolutional networks for biomedical image segmentation, MICCAI 2015
2. Ganaye *et al*, Semi-supervised learning for segmentation under semantic constraints, MICCAI 2018
3. Rohé *et al*, SVF-Net: Learning Deformable Image Registration Using Shape Matching, MICCAI 2015
4. Jaderberg *et al*, Spatial Transformer Networks, NIPS 2015

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[1]www.creatis.insa-lyon.fr
[2]https://ljk.imag.fr/