

Internship at Inria : Medical Image Segmentation with Neural Network and Variational Methods

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The aim of this project is to develop a CNN method for path classification and to link it with a variational method to do image segmentation. It will include a literature review part and a development part using Python through the TensorFlow library. The methods will be applied on 3D medical images.

The internship will be hosted by the Inria team Magrit (web site) and is in the context of the simulation of the respiration with applications such as radiotherapy or surgery. The work will be specifically linked with the INVIVE (http://www.it.uu.se/research/scientific_computing/project/rbf/biomech) project, which aims at modeling the diaphragm behavior.

Keywords : Segmentation - Medical Images - CNN - Python - TensorFlow.

Objective and methodology of the project

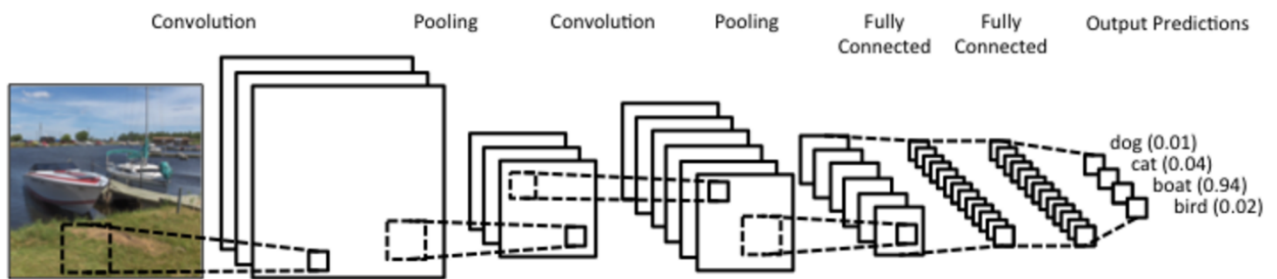
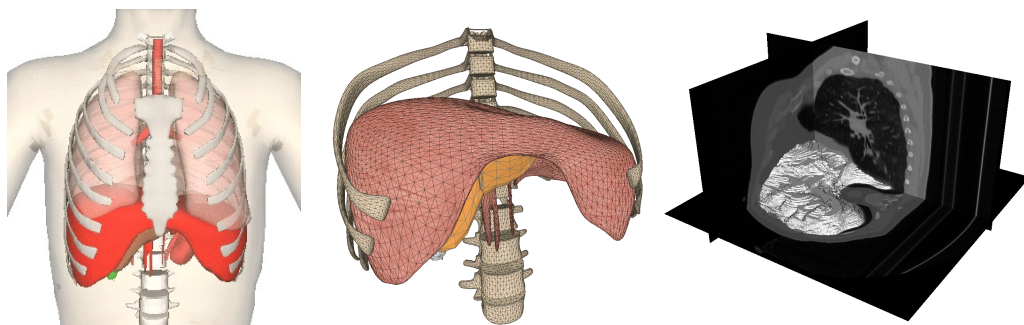


FIGURE – Operating diagram of a CNN

The aim of this project is to combine the predictive power of CNNs with the accuracy of variational models. In this project, we would like to learn a representation of the 3D patches that constitute the 3D medical image in order to discern the diaphragm from other vital organs. This is done by using a set of segmented data from which patches will be extracted. A CNN will be used to classify the patches and coarsely segment the diaphragm. In order to refine the result, a segmentation method by *level-set* will be implemented.



Required and acquired skills

The CNN will be implemented with TensorFlow in Python. The implementation will involve image processing concepts such as patches and methods *level-set*. The intern student will need to acquire knowledge of neural network classification methods. He should also be able to implement variational methods from the literature.