Sampling strategies for efficient CNN-based segmentation

**Duration**: 6 months  
**Preferred start date**: from Match 2018 or later  
**Localization**: Suresnes (92)  
**Contact**: caroline.raynaud@philips.com, hernan.morales@philips.com

**Host entity**

*Philips Healthcare* is a world leader in medical imaging. Its products cover the full range of imaging modalities: X-Rays, MRI, Ultrasound, CT, etc. The company is internationally recognized for the excellence of its technology, developed within innovative research groups.

*Philips Healthcare Medisys Research Lab* is based in Suresnes (92) and is dedicated to medical image processing. The team, with about thirty researchers and engineers, is focused on delivering the most innovative solutions in the domain and is in close contact with famous universities and clinical sites in France and abroad.

**Internship description**

Organs or interventional tools segmentation are key ingredients in many applications helping the clinicians to carry out their diagnosis or interventions. As classification or localization problems, segmentation has greatly benefited from the emergence of Convolutional Neural Networks (CNN) in the previous years.

While in some cases the rarity of training examples is limiting the generalization of the algorithms, in other situations it is the abundance of data that is, paradoxically, problematic. Too much ground truth has to be produced, and too much data has to be processed at each epoch of the minimization.

The internship proposes to explore advanced sampling strategies, either in order to select the most representative/challenging subset of data to edit (limiting the ground-truthing), or in order to focus on a subset of the training set at each epoch of the optimization.

To explore that problem, the trainee will rely on the literature [Yang2017, Wu2017], and test the most promising methods on existing clinical problems (data and ground-truth will be provided). In a second step, the intern will extend the best method(s), or propose different approaches based on her/his recent experience.


**Candidate profile**

- Third year of engineer school / Master 2 Recherche, with specialty in machine learning, image processing or applied mathematics  
- Solid knowledge of statistics, machine learning, deep learning, image processing  
- Experience in Matlab and/or Python  
- English speaking, reading and writing is mandatory  
- Good communication skills and ability to work in a team