Radiomic analysis applied to different ultrasound modalities for breast tumor characterization

2-6 months

Physics for Medicine, Paris

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Context

Tumor development leads to a number of structural modifications of the tumor and surrounding tissues. However, different tumor types develop in different ways, often only visible at a microscopic scale. Radiomic analysis has become increasingly used to extract quantitative parameters from tumor imaging, which are hypothesized to contain information about its microscopic organization. Such analysis is therefore often used to predict tumor development or response to therapy. Radiomic analysis is generally applied to PET or MRI data, but its use on ultrasound images may also provide crucial information. In this project, we aim to evaluate if radiomic analysis applied to ultrasound anatomic images (Bmode), elasticity maps (Shear Wave Imaging: SWE) and tissue organization maps (Backscatter tensor imaging: BTI) may provide useful information for tumor characterization.

We have applied these imaging modalities to 100 human breast tumors, for which histologic data extracted from a tissue sample is also present. We would like to know whether any Radiomic parameters extracted from Bmode, BTO or SWE may be predictive of microscopic tumor characteristics such as grade, hormonal response etc.

Objectives

The objective of this internship is to apply radiomic analysis to the multiparametric data acquired on human breast tumors, extract relevant radiomic parameters and explore predictive models.
The candidate will :

- Become familiar with the image acquisition protocol and different imaging modalities investigated

- Develop and apply radiomic analysis of the data obtained for each modality with an existing pipeline
- Correlate the quantitative parameters to the tumor characteristics and build predictive models using statistics, classification and machine learning tools

We are looking for a candidate with an interest in medical imaging, ideally some knowledge of ultrasound imaging and/or image processing and strong Matlab skills.

Please send your CV and cover letter to beatrice.walker@espci.fr