

## Representation methods for imaging-based cancer heterogeneity: towards virtual biopsy and prognostic subtyping

### Abstract

The field of oncology continues to face significant challenges in characterizing intra-tumor heterogeneity effectively and exhaustively. Despite years of research and clinical practice producing a large amount of data, clinically relevant and statistically sound models for understanding the disease still needs to be discovered. Traditional biopsies and visual inspection of imaging studies have limitations in fully predicting the tumor's proper evolution. As a result, the under-representation of tumor information has hindered the translation of imaging-based precision medicine techniques into clinical practice. To address these challenges, we propose some methodologies to perform virtual biopsy by shifting the current paradigm of medical image analysis, to aid clinical decision-making and prognostic cancer subtyping. The rationale of the talk splits in two parts: part one deals with the assessment of intra-lesion radiological heterogeneity in the virtual biopsy fashion while part two tackles the representation methods for intra-patient radiological heterogeneity for cancer subtyping. Real-world applications span over Colorectal cancer, Hodgkin Lymphoma and Prostate cancer. The difficulty in finding effective imaging biomarkers for therapeutic purposes necessitates the collaboration of different fields, such as medicine, mathematics, geometry, and computer science. This collaboration would lead to a mathematically sound model capable of capturing an image's exhaustive and representative textural and structural features for targeted virtual biopsy purposes. Ultimately, this would improve and go beyond the current radiomic framework to draw prognostic inferences that can be employed in clinics. We support the vision of collaboration between disciplines leading to new ways of modeling, eventually slowing down tumor growth and preventing treatment resistance.

### Speaker

**Lara Cavinato**

**Post doc Fellow**

Politecnico di Milano

