iBraiN's Seminar

Friday, December 20th 2024 – From 11h am to noon

Faculty of Medicine

Meeting room U1253 3rd floor Planiol building

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Quantitative Tissue Characterization Using Ultrasound Scattering for Disease Monitoring and Surgery Guidance

Numerous diseases alter the microarchitecture of organ tissues, also affecting the propagation of ultrasound in these tissues. There is an opportunity to leverage ultrasound parameters of propagation to quantify these changes, with the ultimate goal of monitoring chronic diseases, or screening diseases such as cancer.

In the context of disease monitoring, measuring parameters that are quantitative is critical, so that data can be acquired and compared at different time points in order for disease progression and response to treatment to be followed. Conventional ultrasound imaging can only provide limited quantitative information. We propose instead to work with raw ultrasound data to extract quantitative information on tissue microstructure, by applying physics-based models of ultrasound scattering. Ultrasound signals that propagate in heterogeneous media such as porous bone or lung tissue are highly complex. This complexity is a very rich source of information on tissue structure, which we exploit.

We demonstrate that leveraging ultrasound scattering as a source of contrast for quantitative tissue characterization can be applied to staging lung diseases such as pulmonary fibrosis and edema, or to the characterization of bone diseases such as osteoporosis. We also show that novel imaging methods for lung cancer using ultrasound multiple scattering as a source of contrast holds great promise for the real-time guiding of lung cancer surgery.

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