Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Muleki Seya | Given names : Pauline

Status (prof., assistant prof., …) : researcher

Laboratory : CREATIS | Website address : https://www.creatis.insa-lyon.fr/site/fr

Institution : INSA Lyon, CNRS | Website address : https://www.insa-lyon.fr/

Scientific competence of the supervisor:

Pauline Muleki Seya: Ultrasound imaging, Tissue and vascular microstructure characterization using backscatter coefficient and ultrasound localization microscopy, Implementation of in vivo, or clinical protocols to validate imaging methods. Kailiang Xu: Functional ultrasound imaging, Ultrasound localization Microscropy, Ultrasound brain machine interface. Dr. Kailiang Xu received the Ph.D. degree in biomedical engineering from Fudan University, Shanghai, China, in 2012. He is currently a research professor at Fudan University.

Two major publications in the field proposed for the PhD :

1. Malinet, C... & Muleki-Seya, P. (2025). Evaluation of chemotherapy response in osteosarcoma using quantitative ultrasound: a pilot study relating ultrasound parameters to molecular response. IRBM, 100914.
2. S Cheng, L Xu, D Ta, K Xu*(2026). Coherent Nonlinear Ultrasound Imaging: From Microvasculature to Capillaries, IEEE Transactions on Ultrasonics, 2026

Website address of the personal page :

Supervisor's email : pauline.muleki-seya@creatis.insa-lyon.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** III-7

Title : Evaluation of Tissue Microstructure and Vascularization Using Ultrasound applied to Early Assessment of Anti-Cancer Treatment Efficacy

Subject :

This PhD project focuses on evaluating tissue microstructure and vascularization using ultrasound imaging to enable early, non-invasive assessment of anti-cancer therapy efficacy, particularly an osteosarcoma model. Current methods rely on delayed post-surgical histological analysis, exposing non-responding patients to ineffective treatments. The study leverages ultrasound spectroscopy—analyzing the backscatter coefficient (BSC) and envelope statistics—to extract quantitative parameters related to tissue microstructure, using 2D and 3D imaging (Row-Colum probe), introducing novel BSC calculations. Additionally, ultrasound localization microscopy (ULM) will map microvascular networks to assess angiogenesis and vascular changes during therapy. Preliminary results demonstrate that ultrasound parameters can detect biological changes (e.g., apoptosis, collagen reduction) and distinguish tumor subtypes. The project will correlate ultrasound signatures with histological and molecular analyses (RNA-seq) in murine osteosarcoma models treated with doxorubicin and anti-angiogenic therapy, aiming to validate early biomarkers for therapy monitoring.

Keywords :

Ultrasound imaging, Tissue microstructure, Vascular microstructure, 3D imaging, Cancer therapy evaluation

Expected collaborations :

This thesis will be conducted between the CREATIS laboratory in the Ultrasound Imaging team (Villeurbanne) and Fudan University and in collaboration with Aurélie Dutour in the CRCL laboratory in the Cell Death and Pediatric Cancers team. The student will be supervised by Pauline Muleki Seya and Kailiang Xu. The student will be integrated into both laboratories.

Background required from the applicant :

The ideal candidate will have an engineering degree or equivalent, with a specialization in biomedical imaging and/or ultrasound and/or signal processing. The candidate must be autonomous and have programming skills in MATLAB and signal/image processing. The candidate should also have an interest in experimentation, as they will be involved in ultrasound acquisitions in animal experiments, as well as an interest in medical/biological applications.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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