

## ESR2 - Multi-modality imaging for treatment planning of selective internal radionuclide therapy (SIRT)

**HOST INSTITUTION:** University of Leuven (KU Leuven)

Situated in Belgium, KU Leuven has been a centre of learning for nearly six centuries. Today, it is Belgium's largest university and, founded in 1425, one of the oldest and most renowned universities in Europe. The Medical Imaging Research Center (MIRC) is an interdisciplinary research center in the University Hospital Leuven. The focus is on fundamental and translational research in the area of medical imaging and image processing. The center is a joined initiative of the KU Leuven (Biomedical Sciences) and the University Hospitals Leuven. Over 100 engineers, physicians and physicists are working closely together with bioscientists and clinicians. MIRC-members are the Dept of Electrical Engineering (PSI), the Dept of Imaging and Pathology (Radiology and Nuclear Medicine), the Dept of Cardiovascular Sciences, the Dept of Neurosciences and the Dept of Radiotherapy.

The division of Nuclear Medicine is based at the University Hospital Leuven, and is part of the Faculty of Medicine of the Leuven University. Its mission is centered around the four poles of a university hospital: health care, research, education and community service. The medical physics team has considerable expertise in medical imaging, and in particular in image reconstruction for PET, SPECT and CT.

### DESCRIPTION OF THE ADVERTISED POSITION (ESR2)

This is a 3 year full time position as an early stage researcher (ESR) under the auspice of the ITN program, further extended with 1 year to a 4 year PhD-program. The successful candidate will develop and validate algorithms for personalized treatment planning and treatment verification in selective internal radionuclide therapy (SIRT) for patients suffering from tumors or metastases in the liver. SIRT involves the selective arterial injection of radioactive microspheres ( $^{90}\text{Y}$ , a beta emitter), maximizing their uptake in the tumor cells and minimizing the uptake in healthy tissues. Treatment planning is done with SPECT/CT (using  $^{99\text{m}}\text{Tc}$ -MAA), PET (using  $^{18}\text{F}$ -FDG) with CT or MR, and contrast enhanced cone beam CT. Treatment verification will be done with TOF-PET/MR. This multi modal imaging creates a wealth of information which is currently under-used. The aim of this project is to develop dedicated image alignment (registration) and segmentation techniques in order to extract more information from these images. This will lead to more accurate dose calculations and treatment verification, which in turn will improve the efficacy of the therapy. Treatment verification with PET is challenging, because  $^{90}\text{Y}$  emits only 32 positrons per million disintegrations (producing very noisy data). Therefore, this project also involves the evaluation and further development of PET reconstruction algorithms to suppress noise and at the same time maintain a good spatial resolution.

This work will be done in collaboration with Mirada Medical, Oxford, UK, a company which develops and commercializes medical imaging software, including software dedicated to treatment planning and treatment verification based on multimodal imaging. Therefore, there will be regular secondments to Mirada Medical. In addition, the project may include short-term visits to different HYBRID partners for phantom experiments.

### SPECIAL REQUIREMENTS

- A degree in a mathematical discipline e.g. physics, engineering, computer science (MSc or equivalent)

- Strong interest in algorithm design and software development, and solid knowledge of at least one programming language (e.g. matlab, python, idl, C, R, ...)
- Good command of the English language
- Willingness to travel and flexibility
- Good communication skills (a pre-requisite for cooperating in a multi-disciplinary environment)

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