POSTDOCTORAL RESEARCH ENGINEER (M/F)

ABOUT THE ORGANIZATION :

Oncopole Claudius Regaud is the Comprehensive Cancer Center (CLCC) for Toulouse and Western Occitanie. This private, non-profit institution serves the public interest through three core missions: patient care, education, and research.

The center brings together 1,230 professionals, including 160 physicians and researchers, and is part of the national network of 18 French cancer centers within UNICANCER, sharing its values of solidarity, excellence, and innovation.

Since November 2024, it has held the "Haute qualité des soins" certification from Haute Autorité de Santé, confirming high standards of patient care.

Its strategic plan "Objective 2030" supports expansion, improved quality of work life, and strong commitments to research and innovation.

The center is located on the IUCT-Oncopole campus, alongside the Toulouse Cancer Research Center and teams from Toulouse University Hospital.

More information : www.iuct-oncopole.fr

JOB DESCRIPTION :

Oncopole Claudius Regaud is seeking a Postdoctoral Research Engineer Level 1 (M/F) for a full-time 18-month fixed-term contract. The position is available immediately.

Background and Motivation :

Positron Emission Tomography combined with Computed Tomography (PET/CT) is a cornerstone of modern oncology, providing key quantitative metrics such as the Standardized Uptake Value (SUV) for tumour detection, therapy monitoring, and prognosis. Yet, despite its clinical importance, quantitative PET remains highly sensitive to scanner calibration, reconstruction algorithms, and acquisition protocols—factors that can vary significantly across centres. For instance, accurate delineation and quantification of low-uptake or heterogeneous lesions remain major challenges in PET radiomics and metabolic tumor volume (MTV) segmentation tasks, where image noise and partial-volume effects can strongly bias both visual interpretation and quantitative metrics. Establishing reliable, scalable ground truth for evaluating and harmonizing these systems remains one of the central challenges in quantitative imaging. Conventional phantom-based quality control methods fail to replicate the heterogeneity, noise, and complexity of real patient data, limiting our ability to establish scalable ground truth. Moreover, the scarcity of large, annotated PET datasets with known ground truth poses a major bottleneck for developing, validating and clinical translation of AI and radiomics tools, which depend on reproducible and harmonized imaging data.

Research Context :

Our research group has developed complementary capabilities in physical phantom innovation and computational PET data simulation to bridge this gap:

- Synthetic Data Generation :

In collaboration with GE Healthcare, we developed and validated a synthetic lesion insertion methodology that enables embedding of artificial lesions (spheres) directly (Insertion of Synthetic Lesions: ISL) into raw PET sinogram data prior to image reconstruction. This approach was rigorously benchmarked against physical phantom acquisitions and subsequently extended to clinical datasets, enabling cross-scanner performance evaluation under anatomically realistic and statistically representative conditions.

- Advanced Phantom Design :
  We demonstrated that 3D-printed porous structures can complement substitute conventional fillable spheres for performance assessment. Further, we established that 3D-printed inserts can be reproducibly transferred and measured across institutions, enabling harmonized quantification across PET/CT systems.

Project Objectives :

Building upon this foundation, the proposed postdoctoral project—conducted within the TheraTEP collaboration with GE Healthcare—will extend DUETTO to support heterogeneous, patient-derived lesion modeling. Generation of new clinical dataset with heterogeneous ISL would be the main objective of this study. The fellow will design and lead a retrospective clinical study combining synthetic lesion insertion with real lesions extracted from patient PET datasets and phantom experiments using their 3D-printed surrogates, investigating how lesion heterogeneity, uptake patterns, and scanner characteristics affect quantitative accuracy, lesion detectability. For this purpose our integrated toolbox, CASSOULET framework (Compositional Anthropomorphic Spatial Synthesizer OUtput for Lesion ExporTer)—which enables translation of segmented clinical lesions into both synthetic lesion masks for simulation studies and 3D-printable phantom geometries within a single unified MATLAB-based environment shall be used. Patients and lesions selection will be performed in close collaboration with a physician specialized in PET PSMA imaging, and the qualitative and quantitative analysis will be run using a Lickert scoring method. In this study, only static clinical exams will be analysed with heterogeneity introduced in the lesions. While phantom experiments are expected to provide us with accuracy of the evaluation, physician reporting on modified clinical data in order to include ground truth information should give us useful information on the real performance of PET systems in complex clinical situations.

Missions :

- Promote and support research activities aligned with the Oncopole's mission and Medical Physics objectives.
- Develop, coordinate, and enhance Medical Physics research projects in collaboration with project leaders and medical physicists, including project design, preparation of funding applications, responding to calls for proposals, scientific writing, and participation in national and international conferences.
- Monitor and analyze research activity indicators and reports for the Medical Physics Department.
- Facilitate the transfert of validated research outcomes into clinical practice, supporting medical physicists, physicians, and RTTs, and organizing internal or external training activities (webinars, symposiums).
- Maintain and expand expertise through continuous literature review and propose new research initiatives in one's area(s) of specialization.

- Supervise research internships (e.g., Master's students) and contribute to the co-supervision of theses and postdoctoral projects.

Joining us means becoming part of an institute at the heart of innovation, excellence, solidarity, and humanism.

IDEAL CANDIDATE PROFILE

- Required Coursework: PhD with strong academic background in Nuclear Physics, Radiation Detection & Measurement, and Interaction of Radiation with Matter. A good knowledge in nuclear medicine and PET Imaging would be appreciated.
- Preferred Skills:
  - Experience with programming for data analysis (MATLAB / Python).
  - Previous exposure to medical imaging formats (DICOM) and analysis software (3D Slicer or Equivalent).
  - Experience in clinical trial design and constraints
- Qualities: Possesses a strong theoretical foundation and a desire to apply it to experimental work. Meticulous, analytical, and capable of the independent research. The fellow should be able to communicate and publish the results of this study.
- Proficiency in French & English

LOCATION

1 Av. Irène Joliot-Curie - Toulouse, Midi-Pyrénées 31059 - France

SALARY

Niveau cadre 1 selon la grille conventionnelle des CLCC (3005.42 € Brut) + Prime SEGUR 1 (248.98 € mensuel) + Reprise ancienneté
L'intitulé contractuel et administratif du poste sera « INGENIEUR DE RECHERCHE NIVEAU 1 ».

WORKING HOURS

Cadre Forfait jour

CONTACT

Please send your CV and application letter by email to :
Laure Vieillevigne (Vieillevigne.Laure@iuct-oncopole.fr) and Olivier Caselles (Caselles.Olivier@iuct-oncopole.fr)