30-MONTH POST-DOC OFFER

Building stratification models for early stage Hodgkin lymphoma patients through the development of radiomic biomarkers and their combination with clinical features

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A full-time 30-month postdoctoral position is available at the Laboratory of Translational Imaging in Oncology (LITO) in Orsay, France (www.lito-web.fr), as part of the EraCoSysMed HOLY2020 project. Starting data : Q1-Q2 2021.

Keywords: patient stratification, PET/CT, radiomics, deep learning, GAN, federate learning

Objective: The goal of this project is to develop and validate a model for stratification of early stage Hodgkin lymphoma (HL) patients in a multicenter setting based on PET/CT images and clinical data.

Medical context and hypothesis: The treatment of HL has evolved continuously and more than 80% of patients suffering from HL can be cured by intense treatments including poly-chemotherapy (so-called ABVD chemotherapy) and additional radiation therapy. However, long-term treatment-related complications remain a significant concern in the clinical management of early stage HL patients below 50 years of age. Despite the important role of FDG PET in treatment monitoring of lymphoma patients, it fails to reliably identify those who do not need additional radiation therapy after ABVD chemotherapy. Identification of these patients may not only improve treatment outcome but also reduce treatment-induced side effects and toxicity. Given the complexity and large variety of FDG spatial distribution in the whole-body PET images of HL patients, we assume that machine learning approaches can assist in the identification of spatial pattern of FDG uptake that might bear some prognostic value, which, when combined with clinical features, could provide a non-invasive mean to predict the need for radiation therapy on top of ABVD chemotherapy.

Challenges and potential methodological investigations: All methodological developments will be performed by the QIMP group (Quantitative Imaging and Medical Physics) of the Medical University of Vienna (MUW), Austria and by LITO, as part of the HOLY2020 EU-supported project. The challenges to be tackled by the two teams include:

- Identifying the multi-foci metabolic activity associated with HL over the whole body PET/FDG scan.
- Extracting handcrafted and deep radiomic features to characterize the metabolic activity of the disease.
- Building a model based on the PET/CT images and associated radiomic features to predict the response to treatment and the onset of treatment related sequelae.
- Enhancing the image-based predictive model by integrating radiomic and clinical data.
- Assessing the best performing model in a multicenter setting (3 centers providing data).

The database to be used will include about 500 cases from 3 different centers with complete patient follow-up.

Profile: The successful applicant will have a strong expertise in image analysis with deep learning, should be fluent in English, have good communication and organizational skills, and a PhD in a relevant area (medical imaging, applied mathematics, data sciences). Very good programming skills are required, including knowledge of python and deep learning framework (pytorch, keras, tensorflow). Candidates are expected to be highly motivated, autonomous and fond of working in a multi-cultural and multi-disciplinary environment.

Salary: Depending on candidate past experience.

Location: The 30-month position will be located in LITO, Orsay, France (www.lito-web.fr) and the work will be performed in close collaboration with the QIMP team headed by Thomas Beyer at the MUW, Vienna, Austria.

Contact: To apply, please send extended curriculum vitae with research and programming experiences and a detailed list of publications (English), a cover letter stating your interests and future goals, and references to: irene.buvat@curie.fr

References:

1. Capobianco N, Meignan M, Cottereau AS, Vercellino L, Sibille L, Spottiswoode B, Zuehlsdorff S, Casasnovas O, Thieblemont C, Buvat I. Deep learning FDG uptake classification enables total metabolic tumor volume estimation in diffuse large B-cell lymphoma. J Nucl Med. 2020. in press.
2. Cottereau AS, Nioche C, Dirand AS, Clerc J, Morschhauser F, Casasnovas O, Meignan MA, Buvat I. 18F-FDG-PET dissemination features in diffuse large B cell lymphoma are predictive of outcome. J Nucl Med. 61. 40-45, 2020.
3. Orlhac F, Boughdad S, Philippe C, Stalla-Bourdillon H, Nioche C, Champion L, Soussan M, Frouin F, Frouin V, Buvat I. A post-reconstruction harmonization method for multicenter radiomic studies in PET. J Nucl Med. 59:1321–1328, 2018.