24-MONTH POST-DOC OFFER

PANomic **A**tlas for non-small **CE**ll lung cancer manag**E**ment

A full-time 24-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 ***Panacée*** project. Starting data: December 2020 - February 2021.

Keywords: patient stratification, PET/CT, radiomics, supervised learning, non-supervised learning

Objective: The goal of this project is to develop a panomic atlas for lung cancer patients based on clinical data, histological biomarkers and radiomic features extracted from PET/CT images.

Medical context and hypothesis: In oncology, the main challenge for physicians is to identify the right treatment for the right patient at the right time. This is especially the case for advanced lung cancer, where the identification of biomarkers predictive of treatment response is essential to optimize management. In practice, physicians integrate different types of information into their decisions, mainly from clinical, biological, histological and medical imaging data. Medical imaging, both morphological and functional, is today an essential component in patient management, for diagnosis, therapeutic evaluation and follow-up. However, although medical images are systematically acquired during the patient's care, they remain largely under-exploited today. The assumption that medical images contain much more information than is currently extracted has led to the development of a new discipline, *Radiomics*, which has grown rapidly since 2010 (more than 2500 publications using the term "radiomics" according to PubMed).
Given the complexity and wide variety of data available to physicians, we assume that machine learning approaches can assist in the identification of a small group of patients with very similar characteristics, in a reference database, consisting of patients already treated for the same pathology. The medical history of these "twins" will allow doctors to access valuable information to identify the therapeutic strategy to be adopted for the new subject.

Challenges and potential methodological investigations: All methodological developments will be performed by LITO in close collaboration with the Departments of Nuclear Medicine, Radiology ad Medical Oncology of Institut Curie. The database to be used will include about 400 cases from Institut Curie. The challenges to be tackled include:

- Designing a tool for navigating through an extensive atlas for lung cancer lesions.
- Defining new radiomic features to be integrated into the atlas patient profile in order to fully exploit the potential of whole-body imaging.
- Developing methods to correct for multicentric variability that affects radiomic feature values.
- Identifying biomarkers predictive of response to treatment or prognosis among the characteristics available in the patient profile and to evaluate the contributions of each type of information (clinical, histological, biological, imaging).
- Demonstrating the relevance of the approach to patient management in relation to current practices.

Profile: The successful applicant will have a strong expertise in image analysis and machine 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. Candidates are expected to be highly motivated, autonomous and fond of working in a multi-disciplinary environment.

Salary: Depending on candidate past experience.

Location: The 24-month position will be located in LITO, Orsay, France (www.lito-web.fr).

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:
fanny.orlhac@curie.fr

References:

1. Orlhac F, Cassou-Mounat T, Pierga J-Y, Luporsi M, Nioche C, Bouveyron C, Ayache N, Jehanno N, Livartowski A, Buvat I. Can we identify « twin patients to predict response to neoadjuvant chemotherapy in breast cancer? J Nucl Med. 61:275, 2020.
2. 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.
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