2018-00260 – Post-doctoral/Mathematical modeling of metastatic development in kidney cancer from omics and imaging data

Contract type: Public service fixed-term contract
Level of qualifications required: PhD or equivalent
Function: Post-Doctoral Research Visit
Level of experience: From 3 to 5 years

Context
MONC Project-team

The MONC project-team aims at developing new mathematical models involving partial differential equations and statistical methods based on a precise biological and medical knowledge in order to build numerical tools based on available quantitative data about cancer. The goal is finally to be able to help clinicians and/or biologists to better understand, predict or control tumor growth and metastasis and possibly evaluate the therapeutic response, in a clinical context or for pre-clinical studies. We plan to develop patient-specific approaches (mainly based on medical imaging) as well as population-type approaches in order to take advantage of available large data bases. We claim that our work may have a clinical impact that can change the way of handling certain pathologies.

For more informations: https://team.inria.fr/monc/

Assignment

Inria team Monc is developing mathematical models for cancer development and therapies in strong collaboration with clinicians and biologists. These models are based on sets of differential equations and statistical methods are employed for estimation of the parameters. The hired person will become a member of the Monc team.

The hired person will integrate genetic expression and imaging data from animal experiments into a model for metastatic development. This project is in collaboration with the Laboratoire de l’Angiogénèse et du Micro-environnement des Cancers (LAMC, Inserm U1029) and the Center for Magnetic Resonance of Biological Systems (RMSB, CNRS).

The hired person will have to combine genetic expression, functional and imaging data collected in a biological study of metastatic determinants in renal cancer to develop and validate a mechanistic model for prediction of metastasis. In this project, medical image processing will be greatly eased by using our existing numerical tools. Development of the models will rely on previous expertise in the team on modeling metastasis.

Main activities

The main activities will be to:

- Analyse longitudinal imaging data of metastatic apparition and growth
- Model the impact of isolated genetic alterations identified by our partners on metastatic development
- Use statistical methods (nonlinear mixed-effects) for parameters estimation
- Correlate genetic alterations with metastatic outcome in kidney cancer
- Develop new methods to integrate genomic data into mechanistic models
- Collaborate with the biological, imaging and bioinformatics teams involved in the project
- Use our numerical frameworks, in which developments of this project should be incorporated

Skills

Good developing skills (Python, Matlab)
Mathematical modeling in the life sciences
Scientific computing
Basic data manipulation
Benefits package

- Subsidised catering service
- Partially-reimbursed public transport

Remuneration

2653€ / month (before taxes)