Offer #2022-05502

Post-Doctoral Research Visit F/M Particle-based computer simulations in a virtual liver model to evaluate replacement of histology by Magnetic-resonance-based technologies

Contract type : Fixed-term contract

Renewable contract : Yes

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Context

The location of the position is INRIA Saclay-Ile de France. The selected candidate should perform the project outlined below in close collaboration with the research team SIMBIOTX, and our medical collaborators at Hopital Beaujon and perhaps other clinical partners.

Researchers from SIMBIOTX have developed over decades computational models of multicellular systems with applications in systems biology and systems medicine of multi-cell systems in liver (e.g. Hoehme et. al., PNAS, 2010; Schliess et. al., Hepatology, 2014; Drasdo et. al., J. Hepat. 2014; Hammad et. al., Arch. Toxicol. 2014; Ghallab et. al., J. Hepat. 2016; Aubert et. al. J Biomech 2017 & CMAME 2017; Hoehme et. al., Bull. Math. Biol. 2018; Ghallab et. al., Hepatology 2018; Van Liedekerke et. al., Biomechanics and Modeling in Mechanobiology, 2020) and in in vitro experimental settings (Van Liedekerke et. al., Plos Comput. Biol. 2019 and refs. therein). The models span a wide range of submodels, including tissue organisation models representing each individual cell in time and space, molecular processes inside each cell, as well as models of flow and transport in the tissue (Vartak et. al., Hepatology, 2021, Boissier et. al. International Journal for Numerical Methods in Biomedical Engineering, 37(2), e3422, 2020).

These models are now being integrated into a mathematical virtual liver model that should be used for medical hypothesis testing.

Within the project STEDI-NASH the objective is to establish a model that can – guided by medical data – help to test whether and in how far histopathological information can be inferred from Magnetic resonance data.

The objective is to develop models and implement them to test this hypothesis in silico, guided by the experimental data from experimental and clinical collaborators.

The implementation will be done inside a novel tissue simulation code that is modular and maintained inside the team, which will help and guide in coding.

Regular visits of the collaborator within Paris region and occasional visits of other partners may be necessary.

Assignment

Assignements:

With the help of team members of SIMBIOTX, the recruited person will co-develop and implement model extensions permitting to simulate the diffusion of quasi-particles in a piece of a virtual liver tissue.

The model should contain steps as (1) particle-based simulation of a single or several randomly moving quasi-particles; (2) conversion of the movement into a signal similar as those obtained by MRI-spectroscopy.

The particle movement should occur in a virtual (digital) liver subunit (called lobule). Such a virtual liver lobule in healthy liver is sketched in Van Liedekerke et. al., Biomechanics and Modeling in Mechanobiology, 19, pages 189–220 (2020); Van Liedekerke et. al., Plos Comput Biol 15(3), e1006273 (2019);

More information on request from: dirk.drasdo@inria.fr.

Collaboration :

In a first step, the recruited person will work with several coworkers inside and of SIMBIOTX to discuss the possible model realization and learn about the software tool.

Responsibilities :

The candidate is responsible for pursuing and maintaining the contact between team and our clinical and medical collaborators, mostly at Hopital Beaujon, partially at Univ. Mannheim and IfADo, Dortmund.

Main activities

Main activities (5 maximum) :

- Co-development of model for diffusing quasi-particles in realistic virtual liver lobule structures and other microscopic structures used to calibrate the model.
- Implementation of model on the computer
- Running simulations on the computer
- Maintaining regular interactions with medical/clinical collaborators
- Writing reports / papers.

Additional activities (3 maximum) :

- coordination of data-and information exchange with experimental and clinical partners.

Skills

Technical skills and level required :

- Knowledge in mechanics, stochastic processes and / or in statistical physics
- Knowledge in mathematical model building and implementation on the computer
- Basic knowledge in numerics, ready to read and understand the necessary algorithms
- C++ advanced level

Languages : English (main communication language), reasonable French (preferred by clinical partners)

Relational skills :

- Good interpersonal skills
- Good communications skills
- Reasonable presentations skills

Other valued appreciated :

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

2746 €/month gross salary

General Information

- **Theme/Domain** : Modeling and Control for Life Sciences
  Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Town/city** : Palaiseau
- **Inria Center** : Centre Inria de Saclay
- **Starting date** : 2023-02-01
- **Duration of contract** : 1 year, 2 months
- **Deadline to apply** : 2023-02-28

Contacts

- **Inria Team** : SIMBIOTX
- **Recruiter** :
  Drasdo Dirk / Dirk.Drasdo@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

The person to hire should have knowledge in the following fields:

- Background in for example, computational physics / computational physical chemistry / numerics, in particular if in the fields of classical mechanics, bio-physics, soft matter or granular matter
- Knowledge in Coding in C++
- Basic knowledge in either biology, medicine, biomedical-or bioengineering
- Experience in collaboration with other people, best cross-disciplinary
- Previous experience with academic environment and software is an advantage

Soft skills appreciated :

- Initiative / dynamic
- Pro-active
- Interested in innovation wanting to push frontiers

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.