

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

Type de contrat : CDD
Contrat renouvelable : Oui
Niveau de diplôme exigé : Thèse ou équivalent
Fonction : Post-Doctorant

Contexte et atouts du poste

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.

Mission confiée

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.

Principales activités

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.

Compétences

Informations générales

- **Thème/Domaine :** Modélisation et commande pour le vivant
Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Ville :** Palaiseau
- **Centre Inria :** Centre Inria de Saclay
- **Date de prise de fonction souhaitée :** 2023-02-01
- **Durée de contrat :** 1 an, 2 mois
- **Date limite pour postuler :** 2023-02-28

Contacts

- **Equipe Inria :** SIMBIOTX
- **Recruteur :**
Drasdo Dirk / Dirk.Drasdo@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

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

Consignes pour postuler

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

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 :

Avantages

- 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

Rémunération

2746 €/month gross salary

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.