2018-01103 - Agent-based modeling of tissues

About the research centre or Inria department

Inria, the French National Institute for computer science and applied mathematics, promotes "scientific excellence for technology transfer and society". Graduates from the world's top universities, Inria's 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

Context

INRIA has developed a strong expertise in mathematical modeling of biological systems with medical applications. Working closely with clinicians from several renowned French and German hospitals and one of the best biology and toxicology institutes in Germany, the team Mamba at its INRIA collaborators have been working on the liver for many years, developing models of liver lesions and regeneration, including tissue lesions of the micro-architecture of the liver. They are currently involved in various projects, including the study of fibrosis and cirrhosis of the help the development of clinical treatments, the development of a liver model by bioengineering and the study of hepatic intoxication due to paracetamol.

Recently, the activities are also extended to other diseases such as lymphoma of the central nervous system, where similar methodologies can be applied.

Assignment

The position will be under the main direction of D. Drasdo. It includes a collaboration with Hôpital Paul Brousse, Hôpital Universitaire La Pitié Salpêtrière, Paris, Inst. Curie, and the INRIA team Monc / Bordeaux within two projects, one funded by ANR, the second by the Natl. Inst. of Cancer in France. This requires regular meetings with medical doctors.

The candidate should develop agent-based models and modeling methods to mimic tissue organisation processes mainly at the histological level. This concerns disease processes and regeneration in liver micro-architecture, in vitro systems and lymphomas of the central nervous system (PCNSL). The models will be set up, parameterized and validated based on image information. Hence, interest or/and skills in image analysis are welcome.

The recruited person should meet with clinicians and coordinate our activities with internal and external partners.

Main activities

Main activities:
- Development of agent-based models
- Coding the models
- Testing the code
- Running agent-based model simulations on different applications in biotechnology and medicine
- Communication with biologists and clinicians.

Skills

Technical skills and level required:
- Sound knowledge in mechanics
- Sound knowledge in modeling biological systems
- Ideally knowledge on modeling with agent-based models
- Base knowledge of numerics
- Good coding skills in C/C++
- Linux, windows

Languages: English (compulsory), French if possible (but not mandatory)

Benefits package

- Subsidised catering service
- Partially-reimbursed public transport

Remuneration

Salary based on experience, full benefits

General Information

- Theme/Domain: Modeling and Control for Life Sciences
- Town/City: Paris
- Inria Center: CRI de Paris
- Starting date: 2019-01-01
- Duration of contract: 10 months
- Deadline to apply: 2018-12-31

Contacts

- Inria Team: MAMBA
- Recruiter: Drasdo Dirk / dirk.drasdo@inria.fr

About Inria

Inria, the French national research institute for the digital sciences, promotes scientific excellence and technology transfer to maximise its impact. It employs 2,400 people. Its 200 agile project teams, generally with academic partners, involve more than 3,000 scientists in meeting the challenges of computer science and mathematics, often at the interface of other disciplines. Inria works with many companies and has assisted in the creation of over 160 startups. It strives to meet the challenges of the digital transformation of science, society and the economy.

The keys to success

The candidate should be ready to work in an interdisciplinary team and communicate with biologists and medical doctors. Large level of independendy would be welcome.

Background and knowledge in interdisciplinary research in relation to biology and/and medicine, mathematical modeling in biological systems, and knowledge in programming is required. Ideally this is mathlab, C++, Python.

Moreover, knowledge in development and usage of agent-based model would be extremely useful (example: P Van Liedekerke, MM Palm, N Jagiella, D Drasdo, Simulating tissue mechanics with agent-based models: concepts, perspectives and some novel results, Computational Particle Mechanics 2 (4), 401-444, 2015)

The candidate will have to extend existing code in C++ (code TiSim - tissue simulator) or mathlab.

Conditions for application

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). Authorization 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.

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.