Offre n°2020-02736

Post-Doctoral Research Visit F/M Integration and validation of a Single-Cell-based Gene Regulatory Network in a Multiscale Model of the CD8 T Cell Immune Response

Le descriptif de l'offre ci-dessous est en Anglais

Type de contrat : CDD

Niveau de diplôme exigé : Thèse ou équivalent

Fonction : Post-Doctorant

A propos du centre ou de la direction fonctionnelle

Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 39 research teams and 8 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

Contexte et atouts du poste

A postdoctoral position is open in the Inria Dracula team. The position is to be funded by an ANR grant (MEMOIRE project). Partners of the project are Inria Dracula, Inserm Immunology team (Head Dr. J. Marvel) and AltraBio (private company). While other partners will focus on single cell data analysis, our work will focus on the modeling part: inference of a gene regulatory network, integration of a stochastic Gene Regulatory Network (GRN) into a multiscale model, and validation of the resulting model by comparison with experimental data.

The position is an opportunity to be involved in a strongly interdisciplinary consortium, and to strengthen experience in computational immunology or computational biology by working on single cell data modeling.

The Inria Dracula team focuses on the development of methods and tools for the multiscale modeling of physiological processes, with applications, among others, in immunology (description of the immune response, vaccine design). Dr. Olivier Gandrillon and Dr. Fabien CRAUSTE will co-supervise the postdoc, they have a jointly experience of interdisciplinary works and have already co-supervised several postdocs on computational immunology-related projects.

Mission confiée

The specific CD8 T cell immune response is based on complex interactions between CD8+ T cells with other immune cells as well as target cells. These interactions are either direct cell-to-cell interactions, relying on cell membrane contact, or cytokine mediated. In each case, surface proteins integrate signals that influence CD8 T cell GRN that will compute the signals and will drive cell decisions like survival, differentiation, proliferation, or death. Our group previously introduced a multi-scale model of the CD8 T cell immune response based on the description and dynamical interaction of a cell dynamics model of CD8 T cell and a GRN model [1,2,3]. The later model, however, was focused on the interactions of only 6 genes, whose roles were identified in the literature, and was described by a deterministic ODE system.

The aim of this post-doctoral position is 1st/ to implement a GRN using a piecewise deterministic Markov model inferred from single cell data [4], and 2nd/ to couple the GRN with an existing cell dynamics model [2,3], in order to 3rd/ use the multiscale model to describe experimental data and to investigate the dynamics of CD8 T cells.

The postdoctoral research will be part of an ANR-funded project, MEMOIRE, and the work will be performed in close collaboration with immunologists, located in Lyon. It will require skills in

interdisciplinary communication and computational biology.

[1] S. Prokopiou, L. Barbarroux, S. Bernard, J. Mafille, Y. Leverrier, C. Arpin, J. Marvel, O. Gandrillon, F. Crauste (2014) Multiscale modeling of the early CD8 T cell immune response in lymph nodes: an integrative study. Computation, 2(4), 159-181.

[2] X. Gao, C. Arpin, J. Marvel, S. Prokopiou, O. Gandrillon, F. Crauste (2016) IL-2 sensitivity and exogenous IL-2 concentration gradient tune the productive contact duration of CD8+ T cell-APC: a multiscale modeling study. BMC Systems Biology 10, 77.

[3] S. Girel, C. Arpin, J. Marvel, O. Gandrillon, F. Crauste (2019) Model-based assessment of the role of uneven partitioning of molecular content on heterogeneity and regulation of differentiation in CD8 T-cell immune responses. Front. Immunol. 10, 230.

[4] A. Bonnaffoux, U. Herbach, A. Richard, A. Guillemin, S. Gonin-Giraud, PA. Gros, O. Gandrillon (2019) WASABI: a dynamic iterative framework for gene regulatory network inference. BMC Bioinformatics 20, 220.

Principales activités

Main activities :

- Design and implement a multiscale model
- Write documentation
- Write reports
- Present the works' progress to partners in an interdisciplinary settings

Compétences

- Research: The applicant will have an experience in computational biology, ideally an experience in computational immunology. In addition, any of the following knowledge will be considered as a plus: use of various (deterministic, stochastic) mathematical formalisms, experience in python or C++, experience of parameter estimation with experimental data.
- Language: English (basic French notions may ease daily life)
- Relational skills: interdisciplinary meetings and research are at the core of the project, so it is expected that the Postdoc Fellow is confortable with researchers from other fields. Good ability for team playing will be appreciated.
- The position is gender neutral. Everyone is encouraged to apply.

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

2 653 euros brut / month

Informations générales

- **Thème/Domaine :** Modélisation et commande pour le vivant
- **Ville :** Villeurbanne
- **Centre Inria :** Centre Inria de l'Université Grenoble Alpes
- **Date de prise de fonction souhaitée :** 2020-10-01
- **Durée de contrat :** 2 ans
- **Date limite pour postuler :** 2020-07-31

Contacts

- **Équipe Inria :** DRACULA
- **Recruteur :**
  Gandrillon Olivier / olivier.gandrillon@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 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 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 200 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.

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.

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.