Offre n°2025-08871

PhD Position F/M Computational analysis of mRNA degradation

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

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

Niveau d'expérience souhaité : Jeune diplômé

A propos du centre ou de la direction fonctionnelle

The Centre Inria de l'Université de Grenoble groups together almost 600 people in 24 research teams and 9 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (Université Grenoble Alpes, CNRS, CEA, INRAE, …), but also with key economic players in the area.

The Centre Inria de l'Université Grenoble Alpes is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

Contexte et atouts du poste

The Ph.D. project will be carried out in the project-team MICROCOSME at Inria – Univ Grenoble Alpes under the supervision of Delphine Ropers within the framework of the RECOM ANR project. MICROCOSME is an interdisciplinary team that includes applied mathematicians, engineers, computer scientists,

computational biologists as well as experimentalists from the microbiology/biophysics team BIOP of the Université Grenoble Alpes.

Mission confiée

Mechanistic models are essential to unravel the molecular mechanisms driving cellular responses. However, the integration of high-throughput data with mechanistic knowledge is limited by the availability of scalable computational approaches able to disentangle biological and technical sources of variation.

The objective of the PhD thesis is to combine mechanistic modelling and statistical inference approaches to analyse dynamical transcriptomics data in the context of mRNA degradation in the model bacterium *Escherichia coli*. The candidate will be able to build on the team's previous work showing how the combination of mechanistic and statistical modelling approaches can be used to infer kinetic parameters from dynamic transcriptomic data and identify novel regulatory mechanisms such as competitive effects in mRNA decay [1,2]. The thesis is part of the ANR project RECOM, which aims to assess the role and importance of this regulatory mechanism through mathematical modelling and experiments. In close collaboration with our biologist partner from the Toulouse Biotechnology Institute, the aim of the PhD thesis is to a) adapt or extend the mechanistic modelling and statistical framework to analyse new types of data and experiments performed within and outside the project [3,4] and, in close collaboration with the biologists, b) interpret the results biologically and c) propose experiments to validate the model predictions.

[1] T.A. Etienne, M. Cocaign-Bousquet & D. Ropers (2020). Competitive effects in bacterial mRNA decay. *Journal of Theoretical Biology*, 504, 110333.

[2] T.A. Etienne, C. Roux, E. Cinquemani, L. Girbal, M. Cocaign-Bousquet & D. Ropers (2022). A nonlinear mixed-effects approach for the mechanistic interpretation of time-series transcriptomics data. Preprint. https://inria.hal.science/hal-03652397/.

[3] T. Esquerre, S. Laguerre, C. Turlan, A.J. Carpousis, L. Girbal & M. Cocaign-Bousquet (2014). Dual role of transcription and transcript stability in the regulation of gene expression in *Escherichia coli* cells cultured on glucose at different growth rates. *Nucleic Acids Research*, *42*(4), 2460-2472.

[4] L. Hamouche, L. Poljak & A.J. Carpousis (2021). Polyribosome-dependent clustering of membrane-anchored RNA degradosomes to form sites of mRNA degradation in *Escherichia coli*. *Mbio*, *12*(5), 10-1128.

Principales activités

The PhD candidate will:

- Develop estimation strategies (simplification and/or reduction of mechanistic models of mRNA degradation, development of nonlinear mixed effects - NLME -

models) to estimate degradation parameters from RNA-Seq datasets.

- Assess the utility of the NLME framework for medium- to low-throughput data sets (microfluidic RT-qPCR) and possibly propose alternative statistical inference approaches.

- Apply the different estimation strategies to various datasets obtained in the bacterium *E. coli* subjected to various perturbations, assess the quality of model estimation, and interpret the estimation results.

Compétences

Interested candidates are expected to have a good background in statistical inference and mathematical modelling, and to be strongly interested in biological applications. Good relational skills and English skills are also important for the project

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

2200 euros gross salary /month

Informations générales

- **Thème/Domaine :** Modélisation et commande pour le vivant
  Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Ville :** Montbonnot
- **Centre Inria :** Centre Inria de l'Université Grenoble Alpes
- **Date de prise de fonction souhaitée :** 2025-10-01

- **Durée de contrat :** 3 ans
- **Date limite pour postuler :** 2025-06-30

Contacts

- **Équipe Inria :** MICROCOSME
- **Directeur de thèse :**
  Ropers Delphine / delphine.ropers@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'e?orce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

The candidate is expected to be proactive and open to collaboration in an interdisciplinary environment.

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

Applications must include a CV, covering letter, copy of diploma and valid proof of disabled worker status.

Applications must be submitted online via the Inria website. Processing of applications submitted via other channels is not guaranteed.

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.