Offre n°2025-09215

PhD Position F/M PhD Offer – 3 years – Oct 2025 to 0ct 2028 Clinical trial designs for assessment of medical devices based on digital twins

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

Contexte et atouts du poste

Medical digital twins (MDTs) are emerging as personalized decision-support tools in medicine [3]. Examples of DMDs include clinical decision support systems for healthcare professionals, physical devices paired with software like closed-loop insulin pumps [1], apps for monitoring chronic diseases and more. DMDs can offer considerable benefits to patients, healthcare providers, and health systems, and their number continues to grow exponentially [2]. Their complex, interactive, and adaptive nature challenges traditional clinical trial designs, which were primarily developed for drug evaluation. Thus, there is a critical need for new methodological frameworks to assess the efficacy of MDTs in a clinical setting.

This PhD project aims to design statistical methods for evaluating the longitudinal efficacy of MDTs within realistic clinical trial settings. The originality of the thesis lies in the adaptation of advanced statistical tools to compare MDTs with standard of care (SoC), accounting for adaptability and interim analyses.

Mission confiée

We will consider a two-arm randomized clinical trial (MDT vs. SoC) with longitudinal outcomes. The thesis will be organized in three work packages:

1. Final efficacy evaluation: formalizing a design to assess the longitudinal effectiveness of the MDT at the end of the trial.
2. Interim analysis and adaptive designs: integrating interim analyses to allow for early stopping or design adaptation (e.g., switching to a better-performing MDT).

Principales activités

A use case considered in this thesis is the use of Interleukin-7 (IL-7) as a complementary intervention to antiretroviral therapy in patients living with HIV with low CD4+ T-cell [4]. Mechanistic models based on ordinary differential equations (ODE) simulate the effect of IL-7 and propose adaptive treatment protocols guided by predictions—representing a concrete MDT strategy. Data of clinical trials for repeated cycle of IL7 are available within the labkey datawarehouse of the SISTM team and will serve as a basis for simulation.

Further application could be exploring how such designs can be adapted for health policy evaluation, such as optimizing vaccination strategies under evolving epidemic conditions.

The candidate will conduct simulation studies using synthetic data to compare the MDT-based approach to standard care in terms of efficacy and efficiency.

Compétences

Required skills:

- Solid background in statistics and probability
- Experience with longitudinal data analysis and clinical trial methodology
- Proficiency in statistical programming (R, Python, or Julia)
- Familiarity with simulation studies and model-based inference
- Interest in mechanistic models (ODE) and interdisciplinary research in health
- Ability to work independently and in a team
- Strong scientific writing and communication skills in English

Additional appreciated skills:

- Knowledge of Bayesian inference or adaptive trial design
- Familiarity with medical applications or digital health tools

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking 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

2300€ / month before taxs

Informations générales

- **Thème/Domaine :** Modeling and Control for Life Sciences
  Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Ville :** Bordeaux
- **Centre Inria :** Centre Inria de l'université de Bordeaux
- **Date de prise de fonction souhaitée :** 2025-10-01
- **Durée de contrat :** 3 years
- **Date limite pour postuler :** 2025-07-30

Contacts

- **Équipe Inria :** SISTM
- **Directeur de thèse :**
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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

Applicants should hold a Master's degree (or equivalent) in one of the following fields:

- Biostatistics
- Applied mathematics
- Statistical modeling

Applications should include a CV, academic transcripts, and a motivation letter. Letters of recommendation are welcome.

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

Thank you to send:

- CV
- Cover letter
- Master marks and ranking
- Support letter(s)

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.