Offer #2025-08947

PhD Position F/M Development of a Personalized Anatomical and Biomechanical Eye Model

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Context

Context

The MIMESIS team at INRIA is a leading research group at the crossroads of scientific computing, machine learning, medical imaging, and control. Our mission is to develop cutting-edge digital tools for personalized medicine, particularly through the creation of **digital twins** and advanced **numerical methods** to assist medical interventions. With a strong foundation in **biomechanical modeling of soft tissues** and real-time computational methods, we work closely with clinicians to translate scientific innovations into practical healthcare solutions — from surgical planning to augmented reality and robotic control.

As part of this commitment, the MIMESIS team is now involved in **PREMYOM**, a large-scale, five-year biomedical innovation project focused on **personalized myopia treatment for children**. Coordinated by **EssilorLuxottica** and funded by the **France 2030** national plan, the PREMYOM consortium brings together six prestigious French partners from research, industry, and healthcare: **INRIA**, **Hôpital Fondation Adolphe de Rothschild**, **Institut de la Vision**, **Institut Mines-Télécom**, and **InSimo**.

PREMYOM aims to establish a new standard in pediatric eye care by developing predictive models and digital tools that account for the anatomical, optical, and behavioral factors influencing myopia progression. The project's ambitious goal is to transform how we understand, monitor, and treat myopia—turning personalized

vision care into a reality.

Assignment

Your mission will be to contribute to the development of advanced anatomical and biomechanical models of the human eye and its interaction with the head and neck, as part of the broader goal of improving personalized care for children affected by myopia. These models will form the foundation of a digital twin framework designed to support diagnosis, treatment planning, and the development of custom therapeutic lenses.

You will focus on building accurate 3D representations of the eye using clinical imaging data, such as MRI and OCT scans, and developing average eye models that can be customized based on patient-specific clinical measurements. These personalized models will capture both observable clinical features (e.g. axial length, refraction) and internal anatomical characteristics that are typically not accessible in routine practice. The integration of statistical shape modeling and biomechanical simulation will ensure anatomical realism and predictive capacity, enabling a detailed understanding of how the eye evolves under growth and various treatment options.

In parallel, you will participate in the development of a coupled biomechanical model of the eye-head-neck system. This model will simulate the ocular and postural behavior of children during everyday visual tasks, offering insights into how head and eye movements influence optical performance and the evolution of myopia. It will also serve to evaluate the optical and ergonomic effects of different lens designs during real-life activities, providing essential data to optimize the fit, comfort, and efficacy of therapeutic eyewear.

Ultimately, your work will support the generation of individualized eye models that guide the design of personalized myopia control lenses, based on a combination of anatomical, biomechanical, and behavioral inputs. These models will be integrated into an e-health decision-support tool facilitating real-world application of research outcomes in clinical and commercial settings.

Skills

Technical skills and level required:

- Sound knowledge of numerical analysis and optimization methods
- Sound knowledge of Machine Learning / Deep Learning with Artificial Neural Networks
- Sound knowledge of image processing techniques

Software development skills: Python programming, TensorFlow, Pytorch.

Relational skills: team worker (verbal communication, active listening, motivation, and commitment).

Benefits package

- 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

Remuneration

2200 € gross/month

General Information

- **Theme/Domain :** Computational Neuroscience and Medicine
- **Town/city :** Strasbourg (near the hospital campus)
- **Inria Center :** Centre Inria de l'Université de Lorraine
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-06-23

Contacts

- **Inria Team :** MIMESIS
- **PhD Supervisor :**
  Cotin Stephane / Stephane.Cotin@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run

jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

We are looking for a motivated and skilled candidate with the following qualifications:

Required:

- MSc or PhD in **biomedical engineering, applied mathematics, computer science**, or a related field.
- Strong background in **geometric modeling**, **3D image processing**, and **biomechanical simulation**.
- Proficiency in scientific programming (e.g., Python, C++, or MATLAB).
- Experience with **medical imaging modalities** such as MRI or OCT.
- Familiarity with **statistical shape modeling** or **finite element methods**.

Desirable:

- Experience with **eye modeling** or **ocular biomechanics**.
- Knowledge of **machine learning techniques** for model personalization.

Experience in collaborative research or **interdisciplinary healthcare projects**.

> **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.

Instruction to apply

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).Authorisation 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.