



**Offer #2023-06273**

## **Post-Doctoral Research Visit F/M DRI Campaign [Inria Brasil]: Mathematical modeling of vector-borne diseases**

**Contract type** : Fixed-term contract

**Renewable contract** : Yes

**Level of qualifications required** : PhD or equivalent

**Fonction** : Post-Doctoral Research Visit

### **About the research centre or Inria department**

The Inria research centre in Lyon is the 9th Inria research centre, formally created in January 2022. It brings together approximately 300 people in 16 research teams and research support services.

Its staff are distributed at this stage on 2 campuses: in Villeurbanne La Doua (Centre / INSA Lyon / UCBL) on the one hand, and Lyon Gerland (ENS de Lyon) on the other.

The Lyon centre is active in the fields of software, distributed and high-performance computing, embedded systems, quantum computing and privacy in the digital world, but also in digital health and computational biology.

### **Context**

Every year Inria International Relations Department has a few postdoctoral positions **in order to support Inria international collaborations**.

This year, postdoctoral positions within the frame of **Inria London, Inria Brasil and Inria Chile** programs and to strengthen partnerships with **Simula (Norway), University of Waterloo (Canada) and KAIST and ETRI (South Korea)** are eligible.

The postdoc contract will have a duration of **12 to 24 months**. The default start date is November 1st, 2023 and not later than January, 1st 2024. The postdoctoral fellow will be recruited by one of the [Inria Centers](#) in France but it is recommended that the time is shared between France and the partner's country (please note that the postdoctoral fellow has to start his/her contract being in France and that the visits have to respect Inria rules for missions).

Mostafa Adimy (Dracula), in collaboration with Claudia Pio Ferreira from São Paulo State University (UNESP), will co-supervise the postdoc. They have a common experience in interdisciplinary work and have already collaborated on several research topics, including modeling of vector-borne diseases.

### **Assignment**

#### **Eligibility Criteria**

Candidates for postdoctoral positions are recruited after the end of their Ph.D. or after a first post-doctoral period: for the candidates who obtained their PhD in the Northern hemisphere, the date of the Ph.D. defense shall be later than 1 September 2021; in the Southern hemisphere, later than 1 April 2021.

In order to encourage mobility, the postdoctoral position must take place in a scientific environment that is truly different from the one of the Ph.D. (and, if applicable, from the position held since the Ph.D.); particular attention is thus paid to French or international candidates who obtained their doctorate abroad.

#### **Vector-borne diseases:**

Diseases transmitted by the Aedes mosquito, such as dengue, Zika, and Chikungunya, are still difficult to control because there is no effective vaccine yet. To date, all control efforts focus on the mosquito population and include traditional techniques such as mechanical techniques to reduce mosquito breeding sites and chemical techniques that kill mosquito larvae and adult stages. Recently, the release of Wolbachia-carrying mosquitoes has been cited as a promise to stop arbovirus transmission, but several bottlenecks still compromise the effectiveness of this technique.

**Our goal is to address some of these issues:**

- (i) the impact of diapause and quiescence on mosquito dynamics;
- (ii) the competition between infected and wild mosquitoes in a scenario of imperfect vertical transmission and cytoplasmic incompatibility;
- (iii) the evolution of the Wolbachia-Aedes symbiont;
- (iv) evaluation of selected biological vector control strategies that include the release of sterile male Wolbachia-infected mosquitoes to reduce dengue transmission.

The modeling techniques that will be preferred to address these issues are those based on age-structured non-autonomous partial differential equations to account for mosquito life cycles as well as environmental conditions such as temperature and humidity.

The candidate will join the Dracula team. He/she will have the opportunity to learn from each of the team members who are leading experts in this field of research. He/she will participate in our bi-weekly meetings and monthly seminars.

The Dracula team is very dynamic and will also provide a pleasant working environment with the interaction of other PhD and post-doc students as well as visiting faculty.

In addition, the candidate will participate in our regular exchanges with the team of Claudia Pio Ferreira (University of Sao-Paulo), our main collaborator on the subject within the framework of our Inria-Brazil projects.

## Main activities

- Design, analysis and simulation of age-structured PDEs to model the life cycle of mosquitoes
- Write documentation
- Write reports and articles
- Present the works' progress to partners

## Skills

Technical skills and level required: The candidate will have experience in biomathematics, ideally with knowledge of age-structured models. In addition, the following knowledge will be considered an asset: use of various mathematical formalisms, experience in numerical simulations, experience in parameter estimation.

Languages: English

Relational skills: A good ability to work in a team will be appreciated.

## 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

## General Information

- **Theme/Domain** : Modeling and Control for Life Sciences  
Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Town/city** : Villeurbanne
- **Inria Center** : [Centre Inria de Lyon](#)
- **Starting date** : 2023-11-01
- **Duration of contract** : 1 year
- **Deadline to apply** : 2023-06-19

## Contacts

- **Inria Team** : [DRACULA](#)
- **Recruiter** :  
Adimy Mostafa / [mostafa.adimy@inria.fr](mailto:mostafa.adimy@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

There you can provide a "broad outline" of the collaborator you are looking for what you consider to be necessary and sufficient, and which may combine :

- tastes and appetencies,
- area of excellence,
- personality or character traits,
- cross-disciplinary knowledge and expertise...

This section enables the more formal list of skills to be completed and 'lightened' (reduced) :

- "Essential qualities in order to fulfil this assignment are feeling at ease in an environment of scientific dynamics and wanting to learn and listen."
- "Passionate about innovation, with expertise in Ruby on Rails development and strong influencing skills. A thesis in the field of \*\*\*\* is a real asset."

**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

Deadline for application: June 18, 2023

### **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.